Future Water Supply Study

Executive Summary

Final Report
August 1996

Contra Costa
Water District

C—100437

C-100437

CONTRA COSTA WATER DISTRICT

PLANNING DEPARTMENT

FUTURE WATER SUPPLY STUDY

EXECUTIVE SUMMARY

Gregory Gartrell, Ph.D., Director of Planning

August 1996

CONTRA COSTA WATER DISTRICT

PLANNING DEPARTMENT

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Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
ac-ft	acre-foot, acre-feet
BBID	Byron-Bethany Irrigation District
BMP	Best Management Practices
Bureau	U.S. Bureau of Reclamation
CALFED	Consortium of State and Federal Agencies created through the Bay-Delta Accord
CCCSD	Central Contra Costa Sanitation District
CCWD	Contra Costa Water District (also, the District)
CDFG	California Department of Fish & Game
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CIP	Capital Improvement Program
CNDDB	California Natural Diversity Data Base
CNWS	Concord Naval Weapons Station
CPA	Conservation Program Alternative
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVPIA	CVP Improvement Act
CWA	Clean Water Act
DDSD	Delta Diablo Sanitation District
DOHS	Department of Health Services
DM	Demand Management
du	dwelling units
DWD	Diablo Water District
DWR	Department of Water Resources
EA	Environmental Assessment
EBMUD	East Bay Municipal Utility District
ECCID	East Contra Costa Irrigation District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act (Federal)
FERC	Federal Energy Regulatory Commission
FTE	Full-Time Equivalent
FWSS	Future Water Supply Study
GAC	Granular Activated Carbon
GIS	Geographical Information System
gpcd	gallons per day per capita
gpdpdu	gallons per day per dwelling unit
gpm	gallons per minute
LAFCO	Local Agency Formation Commission
M&I	municipal and industrial
MAF	million acre-feet
MCL	maximum contaminant level

mg/l	milligrams per liter
mgd	million gallons per day
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
O&M	Operations and Maintenance
OCAP	Operations Criteria and Plan
PG&E	Pacific Gas and Electric Company
PS	public/semi-public (land use designation)
RO	Reverse Osmosis
RBDD	Red Bluff Diversion Dam
RWQCB	Regional Water Quality Control Board
SERA	Signficant Ecological Resource Area
SH	Single family residential high (County land use designation)
SL	Single family residential low (County land use designation)
SOI	sphere of influence
SRI	Seismic and Reliability Improvement
SWP	State Water Project
SWRCB	State Water Resources Control Board
TA	Technical Appendix
TAF	thousand acre-feet
TCC	Tehama-Colusa Canal
TDS	total dissolved solids
TID	Turlock Irrigation District
TM	Technical Memoranda
TWSA	Treated Water Service Area
UAW	unaccounted for water
ULFT	Ultra Low Flow Toilet
ULL	Urban Limit Line
USBR	U.S. Bureau of Reclamation (also, the Bureau)
USFWS	U.S. Fish and Wildlife Service
WTP	water treatment plant
WUF	Water Use Factor

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LIST OF EXHIBITS

Executive Summary

FUTURE WATER SUPPLY STUDY

The Contra Costa Water District (CCWD, or the District), after approximately two years of data analysis, review, and coordination, has identified a Preferred Alternative to offer customers a high quality, reliable water supply for the next 50 years. The District's Board of Directors (Board) has adopted the Future Water Supply Study, including the Preferred Alternative and District's Implementation Plan developed as a result of the selection of that Alternative. This document summarizes the decision-making process that culminated in the District's recommendation. The Future Water Supply Study (FWSS) is an important first step in the District's attempt to meet growing water needs over the next 50 years and was designed to be a flexible, "living" planning document, with periodic review and updates to respond to changing conditions.

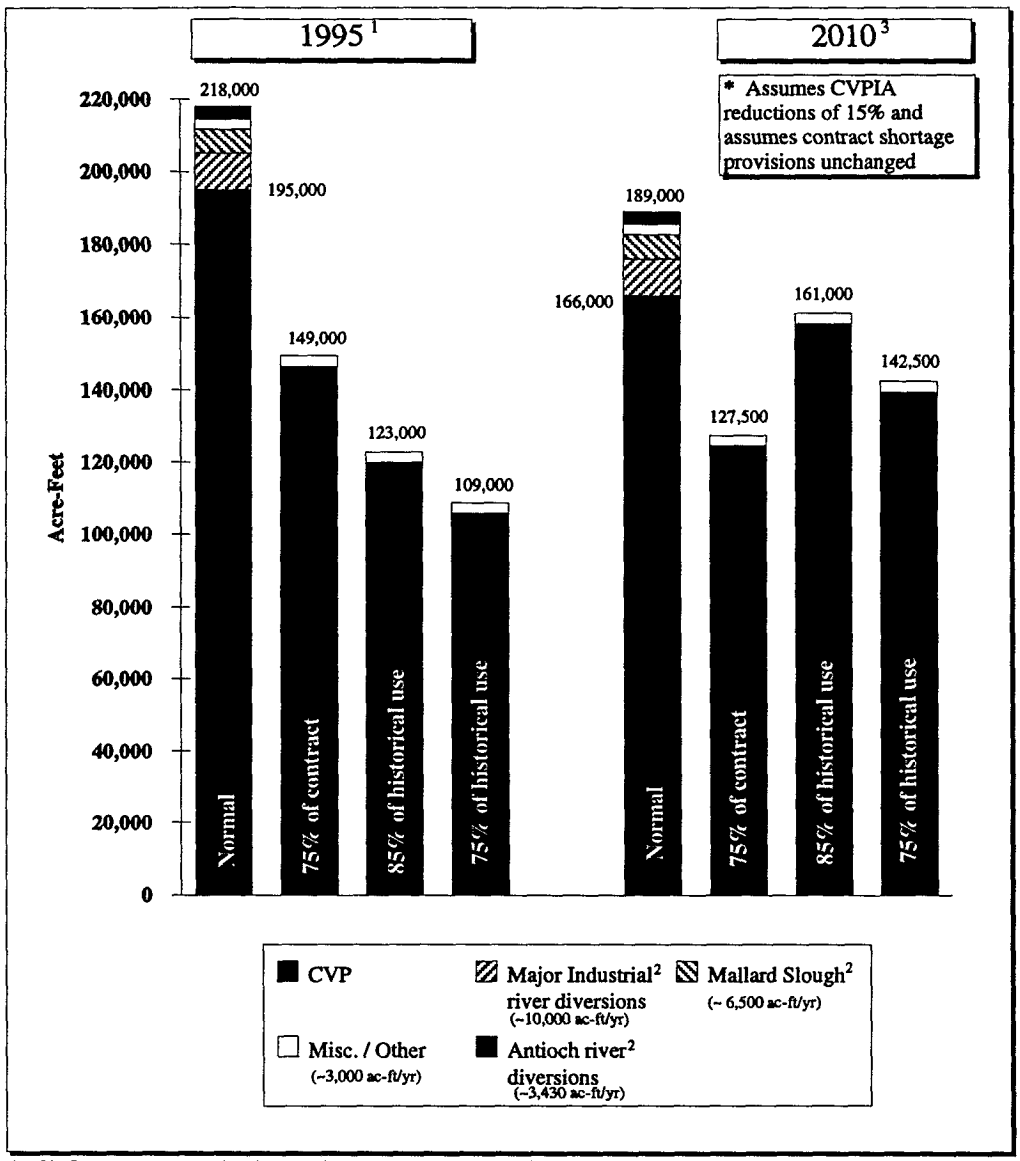
The FWSS was initiated in response to a number of interrelated planning issues that affect the District's ability to meet future water demands. Key planning issues addressed as part of the FWSS include: (1) the uncertainty of future Central Valley Project (CVP) deliveries, (2) the impact of environmental regulation on water supply, (3) increasing water demands, (4) the role of demand management and alternative supplies in meeting future demands, and (5) meeting demands during drought. The FWSS provides an integrated approach to assessing the impact of these planning issues on supply and demand, and developing and evaluating alternatives to ensure future demands are met in a cost-effective, environmentally responsible manner.

IDENTIFICATION OF KEY PLANNING ISSUES

Uncertainty of Future CVP Deliveries

CCWD is a CVP contractor and relies almost entirely on the Federal government (the Bureau of Reclamation) to supply its water through the Sacramento-San Joaquin Delta. Passage of the CVP Improvement Act of 1992 (CVPIA) set new operating parameters for the CVP by reforming water distribution pricing and policies. In effect, the law established the environment as a contractor for CVP water by reallocating 800,000 acre-feet (ac-ft) of CVP yield (600,000 ac-ft in dry years) for environmental restoration of Central Valley fisheries and wetlands. Though the timing and extent of potential reductions in the District's CVP water supply are uncertain, some reduction is likely. For planning purposes, it is assumed in the FWSS that CCWD's contract could be reduced by 15% upon renewal sometime before 2010. Exhibit E-1 demonstrates the impacts such reductions would have on the District's water supply. The exhibit displays water supply for the District under existing conditions in 1995 on the left, and for future conditions, assuming CVPIA reductions of 15%, on the right. Water supply availability is represented for normal, regulatory restricted and drought years for both current and future conditions.

Exhibit E-1
Water Supply Under Existing and Potential Future Conditions



1. 1995 figures are an example based upon a 1995 growth adjusted diversion figure, totaling 141 TAF including the clean fuels program.
2. Antioch and Mallard diversions are an average based on the years 1984,1986 and 1993. Major Industrial diversions are an estimate based on historical use.
3. 2010 figures are based upon a diversion figure of 186 TAF including CVP supplies, Major Industrial, Antioch and Mallard Slough river diversions.

CVP Contract Shortage Provisions

Regulatory Restricted Year = The **Greater** of 75% of Contract (195 TAF) or 85% of Historical use based on an average of the last 3 years unaffected by shortage.
Drought Year = The **Lesser** of 75% of Contract (195 TAF) or 85% of Historical use, but not less than 75% of Historical use.

Note: Normal year bars show total supplies available.

E-2

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The Impacts of Environmental Regulation on Supply

Concerns over the Delta's health and recent regulatory activities make the future of water diversions from the Delta uncertain. These activities could result in restrictions on the timing or quantity of diversions from the Delta, thereby limiting the ability of water providers to meet the needs of their customers. In addition to the CVPIA, major regulatory activities that could affect future CCWD diversions from the Delta include the Endangered Species Act of 1973 (ESA) and the Clean Water Act of 1972 (CWA).

Increasing Water Demand

CCWD water demand has increased over time due to population growth and new development within the District's existing and expanding service area. How these factors will influence future water demand is a threshold question of the Study. Water demand is based primarily on water use factors and land use (or population). Significant new development is planned for East Contra Costa County outside the District's current service area. Most of this area depends on groundwater to meet municipal and industrial (M&I) water needs. However, the long-term reliability of groundwater in the region is limited due to water quality problems and uncertain sustainable yield. Thus, additional supplies will be needed to meet future demand. The East County Water Management Association is studying alternative sources and infrastructure needs in the East County Water Supply Management Study - Phase II.

The Role of Demand Management, Reclamation and Water Transfers in Meeting Future Demand

Until the FWSS, CCWD independently developed water conservation, reclaimed water and surface water supply plans and programs. This Study provides the opportunity to evaluate alternative ways of meeting future demand in the context of an overall water supply plan. A comprehensive approach facilitates District decisions on the level and timing of future investments in each component. Conservation is a component in all the Resource Alternatives developed to meet future demands. The nature and extent of future conservation programs depend on the costs and benefits of conservation compared to other supply components. Several of the District's planning studies on reclamation have identified opportunities to augment surface water supplies with reclaimed water in the service area. The FWSS provides the analysis necessary to determine when different types of reclaimed water projects may become viable alternatives. Before committing to a long-term water transfer, the District needed to evaluate the reliability, availability and costs of such transfers in light of evolving water rights and Bay-Delta regulations, and in comparison to reclaimed water and demand management options.

Meeting Demand During Drought

Drought periods present special circumstances for the District—demand is typically increased while supplies are decreased. Policy issues associated with these circumstances include how much additional water to provide, how far to reduce demand, and how to distribute the costs of meeting drought period demand. The FWSS identifies alternatives for meeting drought period demand and analyzes the interrelationship between short-term strategies and long-term supply alternatives. It is assumed in the Study that the District would meet a minimum of 85% of demand through a combination of long-term conservation and developed supplies during drought periods.

EVALUATION CRITERIA

Evaluation criteria were defined to ensure that key planning issues were addressed and recommendations of the Study are consistent with the mission of the District. The criteria presented in Technical Appendix B and summarized below, were developed as goals of the Study, and used to evaluate the Resource Alternatives to define how well these goals are achieved. The criteria were applied at several stages of Resource Alternative development. Resource Alternatives, or components of Alternatives, that best meet the goals of the Study moved into the next stage; others were eliminated from further study in the context of the FWSS. This approach to screening produced a manageable number of viable Resource Alternatives while allowing flexibility in the final product.

Evaluation Criteria (Final)

O1 **Minimize** water **shortages** (frequency and amount)
O2 Maximize water **system reliability**
O3 Maximize the **quality and treatability** of source waters

Ec1 Minimize **life-cycle costs**
Ec2 Minimize **rate impacts** to customers
Ec3 Minimize **indirect economic impacts** to customers

En1 Minimize environmental impacts to **aquatic habitat** (including threatened and endangered species)
- upstream
- in the Delta
- at the point of diversion

En2 Minimize environmental impacts to **special status terrestrial species and wetland resources**
En3 Minimize impacts to **the community**

I1 Maximize the **seniority of water rights**
I2 Minimize **institutional barriers** and risk of delay
I3 Ensure proper **timing and phasing**

Note: **Bolding** represents key words or phrases by which each criterion may be referred to in future charts, etc., as the Study progressed into the screening and evaluation process.

THE NEED FOR WATER

OVERVIEW

Demand forecasts, which were used to estimate the future need for water, are based on several variables: the size of the service area; the rate, pattern and density of growth; land development potential; future land use types and water consumption by land use; population characteristics; and water use habits. Determining what areas will be served and how each variable will change over time requires making estimates based on current data and trends. Developing and working with alternative future service area scenarios that bracket the range of possible future demand projections provides the opportunity to explore a logical array of demand values.

The key parameter for addressing future demands within this Study was to focus on aggregate demand for each Service Area.

SERVICE AREA DEFINITIONS

Six Service Areas were examined to determine a logical array of demand levels and their geographic distribution. Average annual demand was determined for each Service Area by first reviewing historical data, and then determining the appropriate components to be used in projecting future demand for Residential, Major Industrial and other Non-Residential demands. The six Service Areas are displayed in Exhibit E-2 and can be characterized as follows:

- **Service Area A** - Los Vaqueros Planning Area (plus minor annexations to June 1994): This Service Area includes Antioch, Bay Point, Clayton, Clyde, Concord, Martinez, Oakley, Pacheco, Pittsburg, portions of Pleasant Hill, Port Costa, portions of Walnut Creek and unincorporated areas of Contra Costa County.
- **Service Area B** - CCWD Sphere of Influence[1], including Diablo Water District's (DWD) Sphere of Influence: This Service Area includes Service Area A plus Hotchkiss Tract, Veale Tract, Knightsen and additional portions of Oakley.
- **Service Area C** - Service Area B *plus* DWD Planning Area: This Service Area includes Service Area B plus Bethel Island, portions of southern Oakley, and other unincorporated lands outside of the Urban Limit Line[2].
- **Service Area D** - Service Area C *plus* Brentwood Planning Area: This Service Area includes Service Area C plus unincorporated lands inside and outside of the Urban Limit Line (ULL).
- **Service Area E** - Service Area D *plus* General Plan buildout in East County: This Service Area includes Service Area D plus Discovery Bay, Cowell Ranch, Byron, East County Airport and other unincorporated lands inside and outside of the ULL.
- **Service Area F** - Service Area E *plus* East County "Combination" scenario: This Service Area refers to the *Phase I East County Water Supply Study*, which assumed a densified General Plan buildout, as well as expanding suburbanization. This Service Area includes Service Area E plus remaining unincorporated lands within the county, all of which lie outside the ULL. For those areas outside the ULL, growth has been assumed to occur after the year 2010, when Measure C would expire. The agricultural core has been excluded from any assumed future development.

1 A Sphere of Influence (or SOI) is an area defined by cities and special districts to indicate the logical areas for growth extending into adjacent unincorporated areas, as approved by the Local Agency Formation Commission (LAFCO).

2 The Contra Costa County Urban Limit Line (ULL), "... affirmed by the voters in their adoption of Measure C (1990), is an integral feature of the Contra Costa County General Plan Land Use Element. The purpose of the ULL is two-fold: 1) to ensure preservation of identified non-urban, agriculture, open space and other areas by establishing a line beyond which no urban land uses can be designated during the term of the General Plan, and 2) to facilitate the enforcement of the 65/35 (non-urban/urban) Land Preservation Standard." (*Contra Costa County General Plan*, page 3-14)

Service Areas for Further Study

While demand projections were developed for each Service Area, the District selected three Service Areas for development and evaluation of the FWSS Resource Alternatives. During the Board Workshop on April 12, 1995, the Board agreed to focus further study on Service Areas C, E and F, represented in Exhibit E-3. These service areas were chosen due to their differences in demand. Average demand projections for Service Areas A through C are relatively similar, differing only 7% in 2040 while the difference between Service Areas C and E is 14%. Service Area E increases over Service Area D by 8% in 2040 and Service Area F represents a 20% increase over E. Service Area F was included to examine the high end of potential future demands.

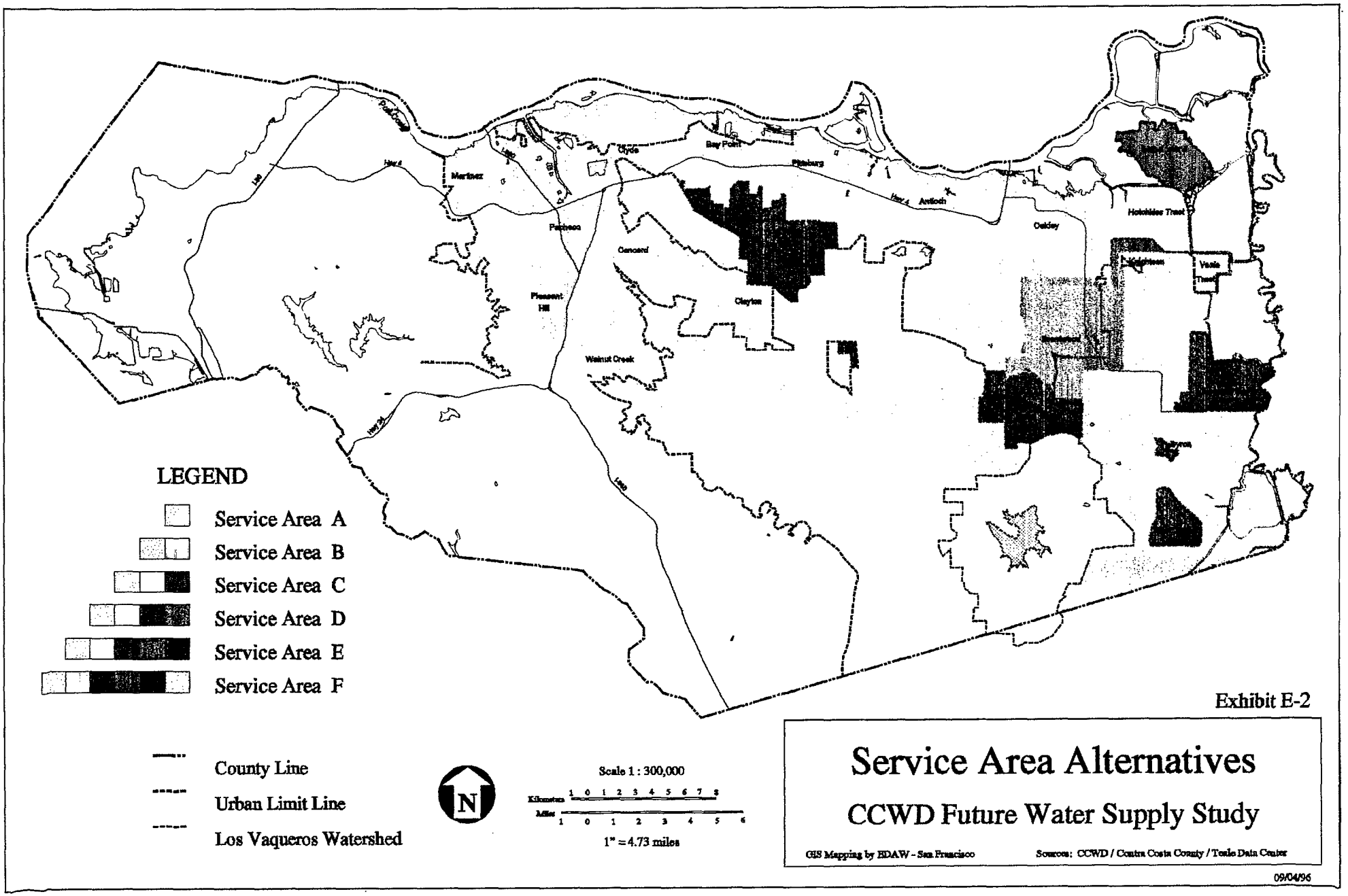

Exhibit E-2

Service Area Alternatives

CCWD Future Water Supply Study

GIS Mapping by EDAW - San Francisco

Sources: CCWD / Contra Costa County / Tonic Data Center

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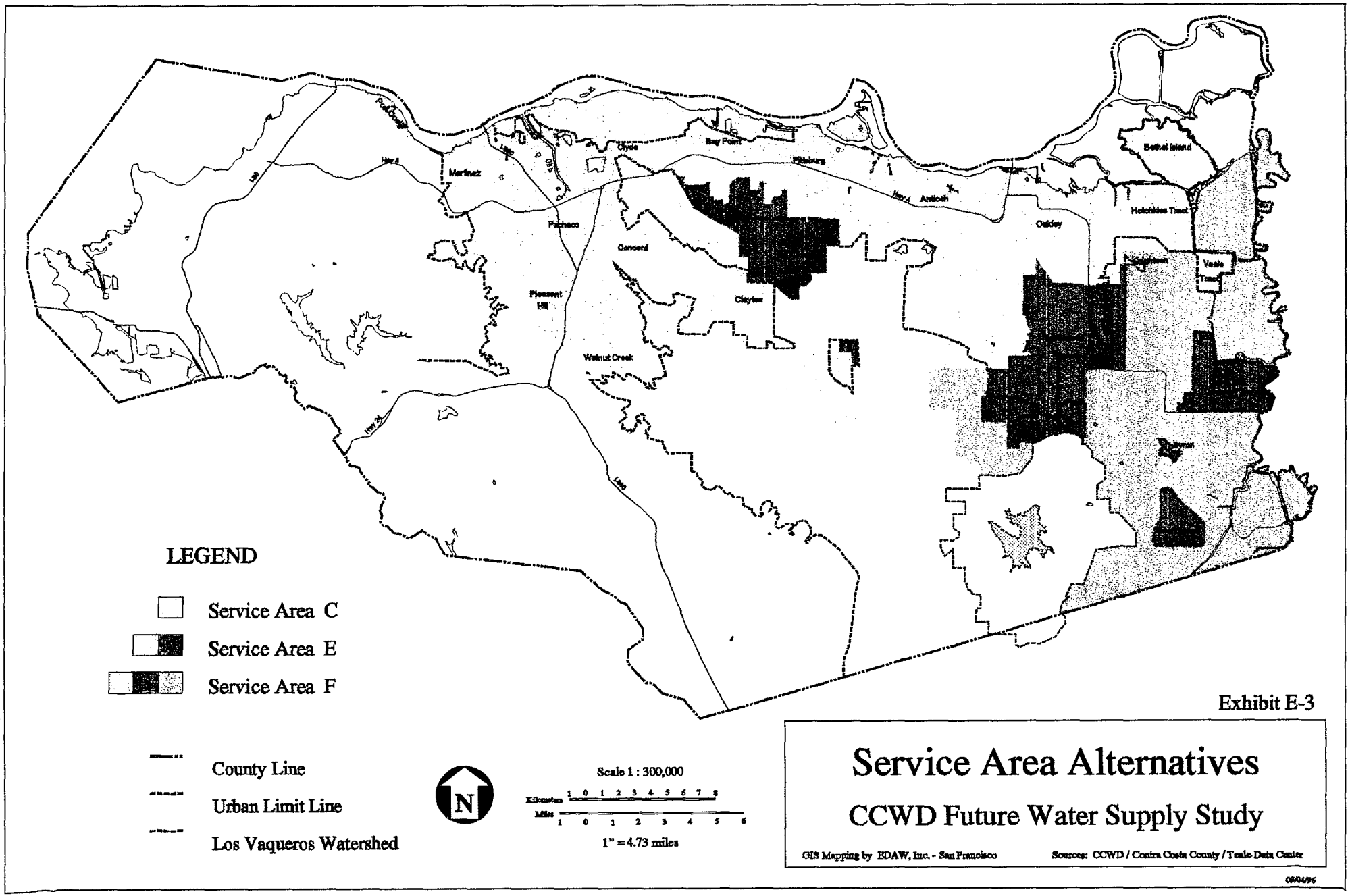

Exhibit E-3

Service Area Alternatives

CCWD Future Water Supply Study

GIS Mapping by EDAW, Inc. - San Francisco

Sources: CCWD / Contra Costa County / Teale Data Center

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DEMAND PROJECTIONS

Average annual demand for each Service Area was projected using data on *Residential* use (land use and population estimates); consumption rates (WUFs and per capita); *Major Industrial* and other *Non-Residential* consumption rates; intensification rates (growth that could occur above and beyond a straight-line growth projection); conservation savings; and unaccounted for water estimates. Each component of demand was analyzed to identify the appropriate data for each subarea (city or jurisdiction), and to develop reasonable assumptions about the reliability of the data, including potential ranges of variability. Demand projections were calculated by adding Residential demand, plus Major Industrial demand, plus Non-Residential demand, minus water savings from conservation (irrespective of CCWD and other retail agency programs), plus UAW.

Water conservation savings from the existing State, Federal and local conservation ordinances are expected to occur irrespective of District and other retail agency interim or long-term programs. These water savings are attributed to the normal replacement of conventional water using devices (e.g., toilets and faucets) with water saving devices. Conservation savings estimates for the years 2000, 2010, 2020, 2030 and 2040 are estimated at 2, 4, 6, 8, and 10%, respectively, assuming that market penetration and the meeting of newer plumbing codes will occur gradually over time. These savings are assumed to occur within the Residential and Non-Residential sectors; Major Industrial customers are assumed to be already operating in a relatively efficient manner.

Unaccounted for water use occurs within all water systems and is calculated as the difference between the quantity of water delivered into the distribution system as measured at the pumping or treatment plant, and the total of all metered quantities billed to customers. A UAW estimate of 7% was used in CCWD's Treated Water Service Area; UAW estimates used in the other municipal distribution areas ranged between 6 and 14%. UAW figures were obtained from each city's water master plan. In addition, the UAW figure for the Contra Costa Canal was a constant rate of 7,000 ac-ft per year (ac-ft/yr), including canal seepage and evaporation and the error in estimating unmetered canal diversions.

Exhibit E-4 presents the average annual demand projected for Service Areas C, E, and F, in ac-ft/yr for the years 1990, 2000, 2010, 2020, 2030 and 2040. Average annual demand represents demand in an average year, and is the amount of water that would be used in the absence of water reductions potentially imposed because of drought. Drought demand is often higher than average demand as the effects of hot and dry weather usually increase the use of both interior and exterior water.

An "envelope" was developed around the average annual demand to acknowledge the uncertainty of the demand projections for each Service Area. The demand envelope represents a possible range of variability above and below average annual demand. The range is influenced by weather, water quality (total Major Industrial needs), uncertainty of population growth, and the uncertainty of conservation water savings (irrespective of CCWD and other retail agencies' programs). These variables potentially increase average annual demand in the year 2040 by as much as 15%, and decrease the average annual demand by as much as 10% (+15/-10%). Exhibits E-5, E-6, and E-7 present the average annual demand and the demand envelopes for Service Areas C, E, and F.

Exhibit E-4
Average Annual Demand Projections[2], 1990-2040, (ac-ft/yr)

	1990[1]	2000	2010	2020	2030	2040
Service Area C	149,300	175,600	198,000	209,500	215,100	217,400
Service Area E	153,600	184,900	219,400	237,300	245,300	247,600
Service Area F	160,200	193,900	234,500	273,100	287,900	297,000

Notes:

All projections for the years 1990 through 2040 have been rounded to the nearest hundred.

1 The 1990 demand shown is not actual but an estimated demand level for 1990, based on the characteristics of each Service Area in 1990. See "Comparison of Actual Sales and Projected Water Use" toward the end of Chapter 3 of the FWSS Report.

2 Demands shown are average year demands, a portion of which may be met through other supplies (Antioch and Major Industrial diversions) in normal and wet years. It is assumed all demands will be met through CCWD supplies during dry years (except groundwater).

Exhibit E-5
Demand Envelope, 1990-2040
Service Area C

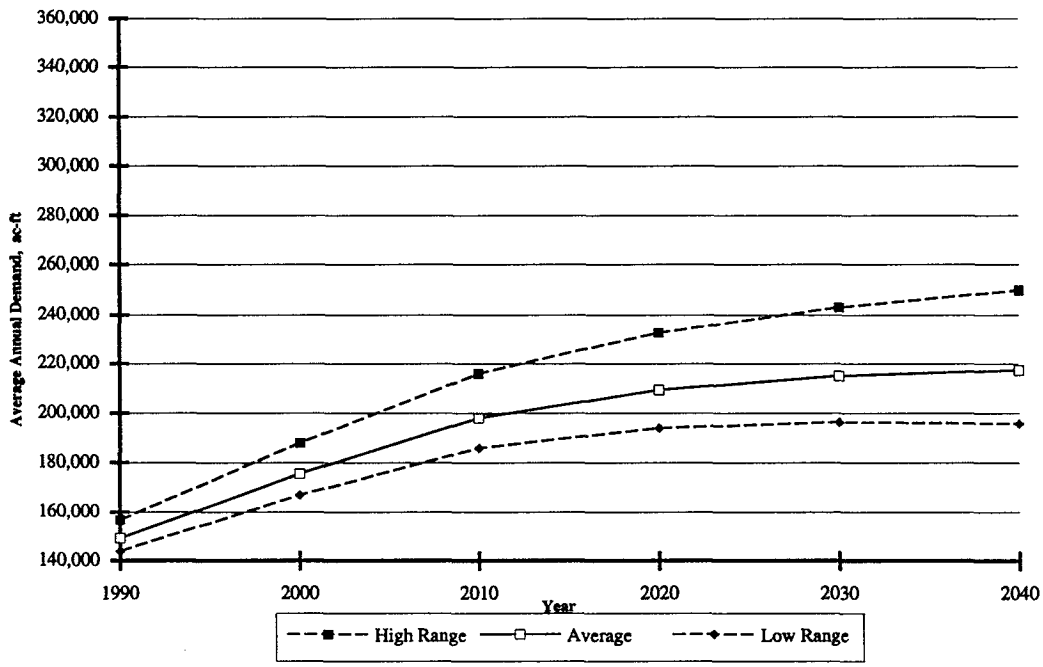

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Exhibit E-6
Demand Envelope, 1990-2040
Service Area E

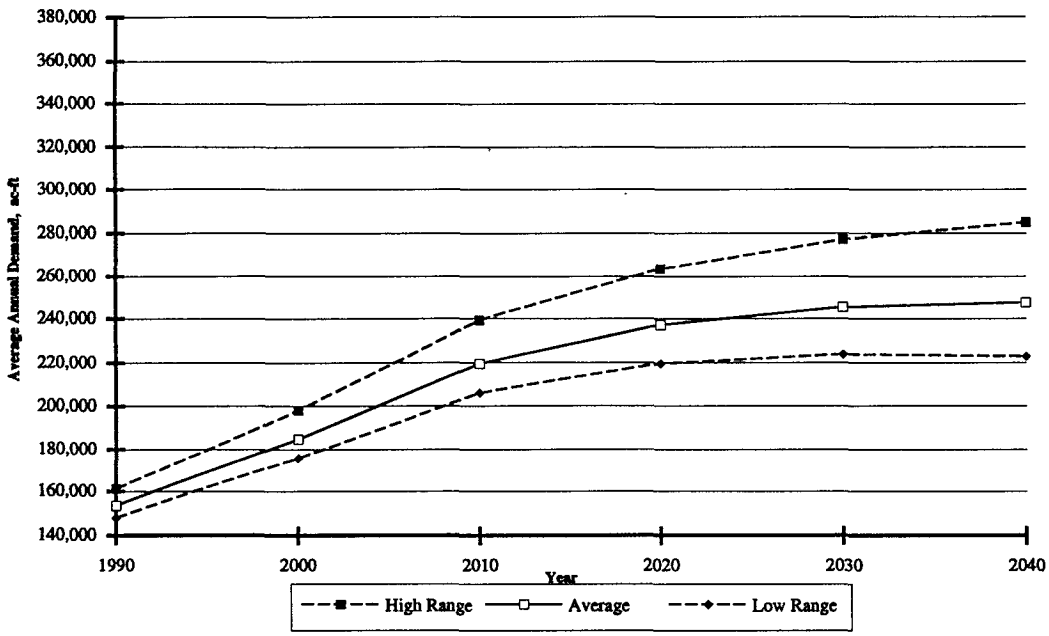
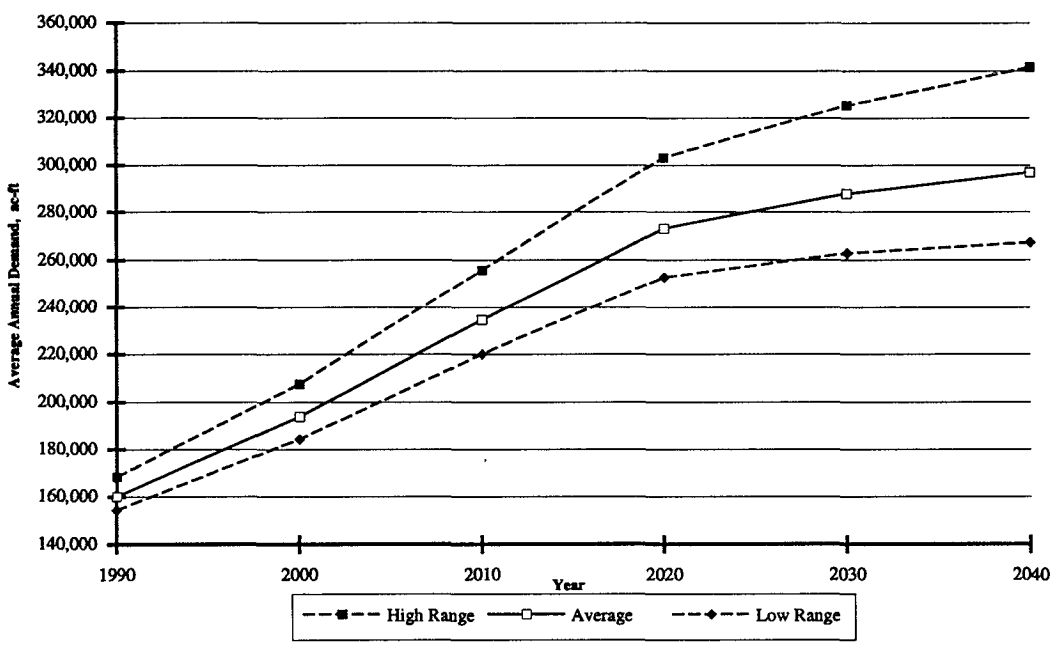


Exhibit E-7
Demand Envelope, 1990-2040
Service Area F



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MEETING WATER NEEDS

Future water needs will likely be met through a combination of the District's existing supplies and additional supply opportunities. This discussion presents the array of water supply improvements and demand management programs that will be combined into Resource Alternatives. Potential future *supplies* for CCWD were investigated in the Sacramento Valley, the San Joaquin Valley, the Delta, the CCWD Service Area and San Francisco Bay. They include groundwater resources, water transfers and exchanges, water use reduction by other users (e.g., agriculture), recycling and desalination. Demand management opportunities, which would reduce the amount of future water supplies needed, were also explored.

EXISTING WATER SUPPLIES

CCWD obtains its water supply through the Sacramento-San Joaquin Delta from sources developed by the CVP and to a lesser extent from water rights developed from surface water flows of the Sacramento-San Joaquin Delta. The primary source of water supply is its existing CVP contract. The contract was amended in 1994 and provides that the Bureau will supply up to 195,000 ac-ft annually to CCWD. Water supply and use in the Sacramento-San Joaquin Delta basin is governed by a complex network of water rights, contracts and agreements involving CCWD, local districts and other entities. CCWD conveys, stores, treats and distributes water through the Contra Costa Canal, a system of storage reservoirs, water treatment facilities and distribution pipelines.

WATER RIGHTS, CONTRACTS AND AGREEMENTS

In addition to its existing CVP contract, CCWD also receives minor supplies from pumped diversions at Mallard Slough and through pumping at the Mallard well fields. In addition, CCWD has obtained an agreement with East Contra Costa Irrigation District (ECCID) to use up to 21,000 ac-ft per year of ECCID water supply to service M&I demands in ECCID, portions of which are now, or potentially may be, within the CCWD Service Area. An agreement with the City of Brentwood provides for the transfer of 7,000 ac-ft/yr to Brentwood for its future water needs. A review of water rights in the current CCWD Service Area identified the City of Antioch, the Gaylord Container Corporation and the Tosco Corporation as having significant surface water rights. Exhibit E-8 lists water rights currently held within the CCWD Service Area, along with respective annual diversion entitlements.

Under ideal conditions, current agreements entitle CCWD to a total annual supply of 242,700 ac-ft, plus an additional 3,000 ac-ft produced from wells (owned by the District and others) in the District's Service Area. In reality, however, the full amount of supply (242,700 ac-ft) is not available due to deficiencies (e.g., CVP supply shortages and water quality conditions in the San Joaquin River).

The frequency of drought deficiencies incurred by CVP M&I water contractors, including CCWD, was analyzed using output from the California Department of Water Resources (DWR) DWRSIM model. DWRSIM output indicates that CVP M&I contractors (including CCWD) would suffer supply deficiencies in one out of every eight years. These deficiencies are for drought only; regulatory restrictions could result in deficien-

Exhibit E-8
Water Rights in the CCWD Service Area

Water Right Statement

Water Rights Holder and Diversion Point	State Water Resources Control Board Numbers	Place of Use	Annual Diversion Right (Ac-Ft) (a)
USBR @ Rock Slough	Permit Nos. 12725, 12726	CCWD	195,000
CCWD @ Old River (Los Vaqueros Project)	Application No. 20245	CCWD	~195,000 (b)
ECCID @ Rock Slough	Agreement with ECCID (c)	Brentwood (d), ECCID	21,000 (e)
CCWD @ Mallard Slough	License No. 3167 and Permit No. 19856	CCWD	26,700
City of Antioch @ San Joaquin River	Statement No. 009352	City of Anitoch Service Area	7,670
City of Antioch @ Antioch Municipal Reservoir	License No. 0002713	City of Antioch Service Area	Unknown
Gaylord Container Corp. @ San Joaquin River	Permit No. 019418	Gaylord Container Corporation	28,000
El DuPont De Nemours & Co. @ San Joaquin River	License No. 000674	El Dupont De Nemours & Company	1,405
Tosco Corp. Lion Oil Division @ San Joaquin River	License No. A010784	Tosco Corporation	16,650
USS Posco	Not listed with SWRCB	USS Posco	12,900

Notes:
(a) Diversion amounts represent maximum diversion capabilities and do not reflect diversion quantities available for all years.
(b) Diversion right at Old River for the Los Vaqueros Project includes capacity for CVP diversions and water quality diversions.
(c) ECCID = East Contra Costa Irrigation District.
(d) Brentwood/CCWD Agreement of October 19, 1995.
(e) Water to be made available in three blocks, phased over a 20-year period (1990-2010).
Data Source: State Water Resources Control Board records.

cies in any year. However, the December 15, 1994 Principles for Agreement have reduced the likelihood of such drought restrictions. Earlier analyses with PROSIM, a model developed by the Bureau, put the drought deficiency frequency between one in seven and one in eight years, depending on the water quality standards applied. For the purposes of this Study, the expected frequency is one in seven years.[3]

Exhibit E-9 contains a partial list of other water rights holders in East Contra Costa County who divert water from the Delta. The list includes appropriative water rights and water right statements. It indicates that, based on full use of permitted diversion rates and diversion periods, water rights for about 209,280 ac-ft/yr exist in this area. Because water rights are limited to amounts that can be put to beneficial use, consumptive use is more representative of the actual water right and would more accurately reflect a volume of water that could potentially be transferred to M&I uses. Exhibit E-10 indicates that the total annual consumptive use in this area is about 60,600 ac-ft.

3 One in seven years was used equally spaced throughout the Study period in the cost analysis as a simplifying assumption, but the implementation discussion addresses multi-year droughts.

Exhibit E-9
Water Rights in East Contra Costa County

Name	Statement No.	Application Number	License Number	Place of Use	Annual Diversion Right (Ac-Ft) (a)
WATER RIGHTS STATEMENTS					
John Bloomfield, et al.	S013812	N/A	N/A	Orwood Tract	10,830
Alvin R. Orman	S005235	N/A	N/A	Brentwood	510
Ernest C. Burroughs	S005234	N/A	N/A	Brentwood	1,310
The Burroughs Trust	S002319	N/A	N/A	Jersey Island	4,740
Ernest C. Burroughs, et al.	S002298	N/A	N/A	Jersey Island	3,090
Oscar N. Burroughs, et al.	S002300	N/A	N/A	Jersey Island	5,390
Oscar N. Burroughs, et al.	S002299	N/A	N/A	Jersey Island	5,390
Emerson Dairy, Inc.	S002320	N/A	N/A	Jersey Island	2,070
APPROPRIATIVE RIGHTS					
Delta Farms Reclamation District #2024	N/A	A002950	001570	Orwood Tract	14,730
Delta Farms Reclamation District #2025	N/A	A002951	001571	Holland Tract	26,860
Delta Farms Reclamation District #2026	N/A	A002952	001572	Webb Tract	34,880
William M. Looney, et al.	N/A	A002593	000358	Orwood Tract	4,690
Mantell Brothers	N/A	A016229	006092	Orwood Tract	1,090
Church of Jesus Christ of Latter Day Saints	N/A	A006587	001605	Byron Tract	17,160
Church of Jesus Christ of Latter Day Saints	N/A	A008338	04953	Byron Tract	10,140
Palm Tract Company	N/A	A004942	01333	Palm Tract	22,300
Edna M. Fallman	N/A	A0002718	000359	Orwood Tract	1,450
H. John Bloomfield, et al.	N/A	A0002949	001852	Orwood Tract	8,510
Sheldon G. Moore, Nancy D. Moore, and Daren D. Moore	N/A	A0004635	001289	Orwood Tract	4,530
Alba C. Houston Orchard Company	N/A	A0015094	005173	Byron Tract	490
Jersey Island Reclamation District #830	N/A	A0003768	001310	Jersey Island	29,120
UNQUANTIFIED PRE 1914 WATER RIGHTS					
East Contra Costa Irrigation District (ECCID)	N/A	N/A	N/A	ECCID Service Area	50,000 (b)
Byron-Bethany Irrigation District (BBID)	N/A	N/A	N/A	BBID Service Area	40,000 (c)

Notes:

(a) Diversion amounts represent maximum diversion amounts and do not reflect actual consumptive use amounts that would be available for transfer.

(b) ECCID's annual entitlement is based on contractual agreement with the Department of Water Resources: the actual entitlement for this pre-1914 water right may exceed 50,000 ac-ft/year. The current diversion is approximately 30,000-35,000 ac-ft/yr.

(c) BBID's annual entitlement is based on historical diversion over a 20-year period from 1970 to 1990; actual entitlement for this pre-1914 water right may exceed 40,000 ac-ft/yr.

Data Source: State Water Resources Control Board records. "East County Water Supply Management Study: Phase I - Supply and Demand." Contra Costa Water District, 1994.

E-13

Exhibit E-10
Estimated Consumptive Use of Crops
East Contra Costa County

	Pasture	Alfalfa	Field	Sugar Beets	Grain	Rice	Truck	Tomatoes	Orchard	Vineyard	Safflower	Corn	
Evapotranspiration of Applied Water (acre-feet per acre)	3.0	2.6	2.0	2.2	1.5	3.1	1.9	1.9	2.3	1.7	1.5	1.8	**Total**
Hotchkiss Tract	4,788	273	96	0	243	0	0	0	0	0	0	0	5,400
Bryon Tract	1,140	148	286	900	2,537	0	1,372	0	0	0	300	1,318	8,001
Jersey Island	5,757	0	0	0	44	0	0	0	0	0	0	923	6,724
Orwood Tract	0	520	0	0	1,596	0	1,155	0	0	0	0	1,368	4,639
Holland Tract	7,554	49	0	0	756	0	0	0	0	0	0	205	8,564
Webb Tract	0	0	3,478	0	2,979	0	0	0	0	0	0	1,386	7,843
Palm Tract	87	0	0	0	2,096	0	0	0	0	0	0	1,300	3,483
Bradford Tract	1,026	0	0	0	186	0	0	524	0	0	0	1,967	3,703
Veale Tract	315	939	172	0	671	0	0	0	0	0	0	121	2,218
Undesignated Area	2,793	174	0	961	414	0	0	578	67	65	0	565	5,617
Bethel Island	1,824	99	0	0	1,197	0	0	0	0	0	0	0	3,120
Coney Island	144	0	0	0	1,184	0	0	0	0	0	0	0	1,328
Total	25,428	2,202	4,032	1,861	13,903	0	2,527	1,102	67	65	300	9,153	60,640

Data Source: California Department of Water Resources Bulletin 113-3, April 1974; and California Department of Water Resources Model.

POTENTIAL FUTURE WATER SUPPLY SOURCES

A full range of potential supplemental supply sources has been identified from water service agencies throughout the Central Valley and neighboring hydrologic regions. The identification of a potential water supply source in this Study, however, does not imply a willingness to develop or provide resources to CCWD by a participating agency or project. The findings reported are preliminary in nature, and the development of a water supply from any of the agencies or projects identified here would require specific negotiations to determine the actual amount of water that could be developed for transfer to CCWD.

The identification of a potential source of water supply in this Study does not imply a willingness to develop or provide resources to CCWD by a participating agency or project.

Preliminary Selection Conditions

Several initial selection conditions were developed to identify a meaningful range of potential water supply opportunities to evaluate and screen as part of the FWSS. The following selection conditions were designed to eliminate water supply sources that would not now, or in the future, provide CCWD with a reliable supplemental water supply.

(1) A potential water supply source could be transferred either directly, or by exchange, to CCWD intake facilities in the Sacramento-San Joaquin Delta.

(2) Potential water supply sources would be identified from agricultural or from M&I supplies where entitlements are not completely utilized.

(3) Potential water supply sources developed from Federal CVP contractors must have a minimum entitlement of 40,000 ac-ft.

(4) Potential water supply sources must be considered reliable, based on a water service agency's ability to transfer supplies to another agency. The geographic regions identified as unreliable are listed below.
- Tehama-Colusa Canal
- South of Delta Exporters
- Tulare Basin

Water Supply Categories

A wide range of water supply sources was evaluated for possible transfer opportunities. The following water supply categories were identified as alternatives that could yield surplus supplies for transfer to CCWD:

(1) Surface water supplies.

(2) Water use reduction measures by others:
- Land fallowing,
- Crop shifts, and
- Agricultural water conservation measures by others.

(3) Additional reservoir surface storage that could provide new yield from currently unregulated flows.

(4) Groundwater export, substitution and conjunctive use.

(5) Wastewater reclamation.

(6) Desalination.

Transfers and Water Rights

The transfer of water to CCWD would involve water supply sources not under CCWD control or ownership. Transfers would have to be negotiated with one or more entities holding water rights and would depend on the entities' willingness to transfer all or a portion of their surplus rights to CCWD. Water transfers would be subject to the water rights conditions associated with the transferred supply source. Some rights are defined by the Water Code and others are contractual or based on historical practices maintained through the present time. All rights are subject to the Constitutional requirement of reasonable beneficial use. Transferable water must be "real water," as contrasted with "paper water" to which there may be rights but no beneficial use has been developed. In other words, water rights are generally limited to the amount of water that has historically been put to reasonable beneficial use. Within the study area, water rights of various entities include pre-1914 appropriations, post-1914 appropriations, riparian rights and prescriptive water rights. These water rights govern use by CVP, SWP contractors and many other entities.

Regional Availability and Transfer Conditions

Potential water supply sources for CCWD are summarized by major hydrologic region and by county in Exhibit E-11. Exhibit E-12 shows the general location of each of the potential water supply sources and the major water resource features associated with these supplies. Exhibit E-13 describes each of the water supply sources identified as potential transfer partners with CCWD. Included in the exhibit are the amount and type of entitlement, the source of the supply and the availability of the supply. A majority of the potential supply sources are from agricultural water supplies and therefore available during the agricultural season.

Potential development of groundwater resources includes groundwater substitution, export and conjunctive use of surface water. Groundwater substitution, or exchange, involves transferring all or a portion of surface water entitlements and replacing the increment of transferred surface water with groundwater to irrigate crops. The surface water that would have otherwise been diverted for irrigation would then be transferred to CCWD. Implementing such a transfer would require identifying willing sellers and overcoming source area concerns about groundwater impacts such as overdraft, subsidence and the general distrust of some communities toward such programs. Exhibit E-11 identifies potential groundwater development opportunities, particularly export and substitution scenarios, included in the FWSS.

Potential recycled water opportunities for CCWD include urban landscape irrigation projects, industrial reuse projects, agricultural irrigation projects, and groundwater recharge recycling projects. Potential projects could be located throughout the District's current Service Area, as well as the Central Valley and San Francisco Bay Area. Recycled water projects within the CCWD Service Area could conserve potable water supplies for existing and future users, while recycled water projects in other parts of the Central Valley could free up existing raw water supplies for transfer to CCWD. Most projects would require construction of water treatment and distribution facilities.

Exhibit E-11
Summary of Potential Water Supply Sources for Contra Costa Water District

Potential Source	Water Source	Potential Water Supply (Acre-Feet)	Type of Water Supply			
			Surface Water	Ground-Water	Reclaimed Water	Desalinated Water
SACRAMENTO RIVER BASIN						
Shasta County						
Anderson-Cottonwood I.D.	Sacramento River	175,000	X			
Tehama County						
Corning W.D.	Thomes Creek - Corning Canal	25,300	X	X		
Butte County						
M & T Inc.	Sacramento River	17,956	X	X		
Butte W.D.	Thermalito Afterbay - Feather Riv.	133,200	X	X		
Oroville-Wyandotte I.D.	S. Fork Feather River	30,000	X			
Richvale I.D.	Feather River - Cherokee Creek	150,000	X	X		
Glenn County						
Orland Water Users Assoc.	Stony Creek - Orland Project	96,000	X	X		
Glenn-Colusa I.D.	Sacramento River	825,000	X	X		
Princeton-Cordora-Glenn I.D.	Sacramento River	67,810	X	X		
Provident I.D.	Sacramento River	54,730	X	X		
Colusa County						
Maxwell I.D.	Sacramento River	17,980	X			
Reclamation District No. 108	Sacramento River	232,000	X	X		
Reclamation District No. 1004	Sacramento River	71,400	X	X		
Colusa Basin Drain M.W.C.	Colusa Basin Drain	57,637	X			
Proposed Sites Reservoir	Sacramento River	Unknown	X			
Sutter County						
Sutter Extension W.D.	Feather River	176,000	X			
Sutter M.W.C.	Sacramento River	267,900	X	X		
Pleasant-Grove-Verona	Sacramento River	26,290	X			
Meridian Farm W.C.	Sacramento River	35,000	X			
Yuba County						
Yuba County W.A.	Yuba River	332,700	X	X		
Hallwood I.D.	Yuba River	78,000	X	X		
Yolo County						
Woodland Farms/Conaway Ranch	Sacramento River	51,162	X	X		
Reclamation District No. 999	Sacramento River	75,000	X	X		
Delta Lowlands	Delta channels	83,000	X			
Sacramento County						
Natomas Central M.W.C.	Sacramento River	120,200	X	X		
City of Sacramento	American River / Sacramento River	326,000	X			
SMUD	American River	60,000	X			
Delta Lowlands	Delta channels	107,000	X			
Placer County						
Placer County W.A.	American River	237,000	X			
Proposed Auburn Dam Reservoir	American River	200,000	X			
Solano County						
Reclamation District No. 2068	Sacramento River	45,000	X			
Delta Lowlands	Delta channels	114,000	X			
DELTA-SAN FRANCISCO BAY						
Contra Costa County						
Contra Costa W.D.	Delta channels	195,000	X	X		
East Contra Costa I.D.	Delta channels	50,000	X	X		
Byron-Bethany I.D.	Delta channels	40,000	X	X		
Delta Lowlands	Delta channels	38,000	X			
Proposed Kellogg Reservoir	Delta channels	Unknown	X			
Mallard Slough	Mallard Slough	26,700				X
Sacramento River	Sacramento River	26,700				X
Central Contra Costa Sanitary District	Reclaimed wastewater	50,000			X	
Delta Diablo Sanitary District	Reclaimed wastewater	19,000			X	
Ironhouse Sanitary District	Reclaimed wastewater	2,500			X	
Brentwood Sanitary District	Reclaimed wastewater	2,200			X	

The identification of a potential water supply source for the purposes of this study does not imply a willingness to develop or provide resources to CCWD by a particular agency or project.

Exhibit E-11 (Continued)
Summary of Potential Water Supply Sources for Contra Costa Water District

Potential Source	Water Source	Potential Water Supply (Acre-Feet)	Type of Water Supply			
			Surface Water	Ground-Water	Reclaimed Water	Desalinated Water
DELTA-SAN FRANCISCO BAY (continued)						
Contra Costa County (continued)						
Contra Costa Sanitary District 19	Reclaimed wastewater	1,300			X	
Byron Sanitary District	Reclaimed wastewater	100			X	
Alameda County						
East Bay MUD	American River	150,000	X			
Bay Area Discharges	Reclaimed wastewater	400,000			X	
SAN JOAQUIN RIVER BASIN						
San Joaquin County						
Banta Carbona I.D.	Delta Mendota Canal	173,000	X			
South San Joaquin I.D.	Stanislaus River	300,000	X			
Woodbridge I.D.	Mokelumne River	116,700	X			
City of Tracy	Reclaimed wastewater	30,000			X	
Delta Lowlands	Delta channels	303,000	X			
Delta Storage Reservoirs	Delta channels	Unknown	X			
Stanislaus County						
Oakdale I.D.	Stanislaus River	300,000	X	X		
Modesto I.D.	Tuolumne River	154,400	X	X		
Turlock I.D.	Tuolumne River	400,000	X	X		
City of Modesto	Reclaimed wastewater	27,000			X	
Merced County						
CVP Exchange Contractors	Delta Mendota Canal	85,000	X			
Merced I.D.	Merced River	570,000	X			
Proposed Los Banos Reservoir	Delta	Unknown	X			
Madera County						
Chowchilla W.D.	Buchanan Dam - Madera Canal	239,000	X	X		
Madera I.D.	Madera Canal	271,000	X	X		
Kern County						
Berrenda Mesa W.D.	California Aqueduct	155,100	X			

The identification of a potential water supply source for the purposes of this study does not imply a willingness to develop or provide resources to CCWD by a particular agency or project.

Exhibit E-14 identifies the principal transfer considerations for each type of water source listed in Exhibit E-13. The descriptions in Exhibit E-14 apply to the broad range of potential water source categories. However, there may be exceptions for a particular source, which would usually be identified only in specific transfer negotiations. Transferable quantities may be limited to consumptive use and irretrievable losses and, in the case of storage withdrawals, would be discounted by the amount of storage refill that was determined by the SWRCB to injure another lawful water user. Similar requirements might be locally imposed for groundwater storage transfers.

POTENTIAL CONSERVATION COMPONENTS

Conservation programs reduce demand, thereby reducing water supply needs. Three Conservation Program Alternatives (CPAs) which result in conservation savings between 5 and 12% were developed as part of the FWSS. The three CPAs were designed to achieve increasing levels of demand reduction and meet requirements of the CVPIA Best Management Practices (BMPs). The CPAs will achieve savings in addition to the 6 to 10% savings that CCWD will realize even if the District undertakes no additional conservation efforts. These conservation savings irrespective of CCWD programs will result from State and Federal regulations (excluding BMPs) and the normal replacement of fixtures and devices with more efficient models.

Exhibit E-12
Potential Water Sources for Contra Costa Water District

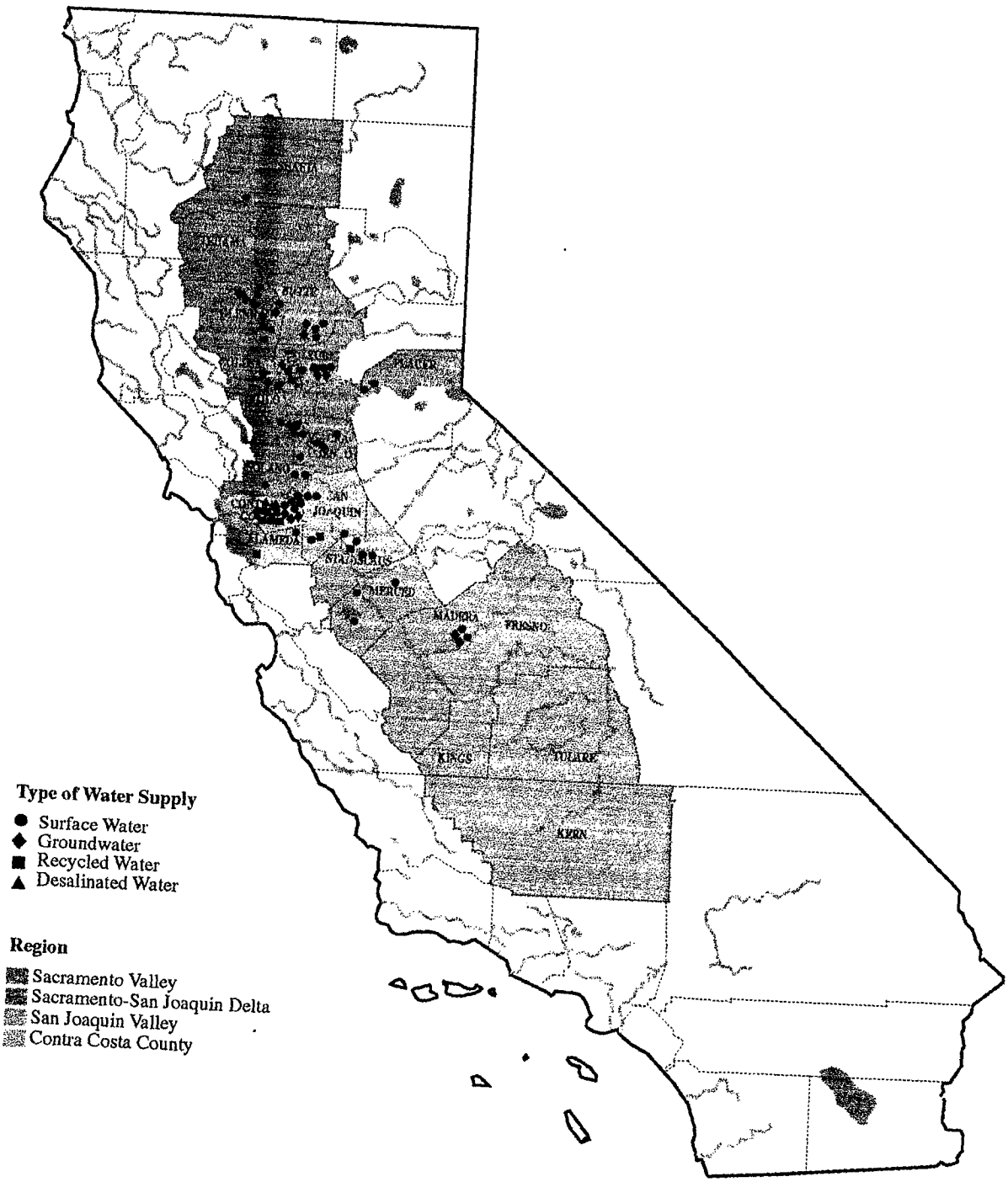

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Exhibit E-13
Potential Water Supply Sources For Contra Costa Water District

Potential Source	Irrigated Acreage (Acres)	Annual Water Use (Acre-Feet)	Surface Water Supplies				Groundwater
			Water Rights Entitlement (Acre-Feet)	Rights/Entitlement	Source	Supply Availability	Potential Groundwater Sources
SACRAMENTO RIVER BASIN							
Shasta County							
Anderson-Cottonwood I.D.	32,000 1	165,000 a, 1	10,000 2	CVP-Ag	Sacramento River	1	
			165,000 2	State Water Rights	Sacramento River	4	
Tehama County							
Corning W.D.	11,000 1	20,300 a, 1	25,300	CVP-Ag	Corning Canal - Thomes Creek		Substitution
Butte County							
M & T Inc.		17,956 b, 2	976 2	CVP-Ag	Sacramento River	1	Substitution
			16,980 2	State Water Rights	Sacramento River	4	
Butte W.D.	26,600 1	133,200 a, 1	133,200 a	State Water Rights - Feather River	Thermalito Afterbay	2	Substitution
Oroville-Wyandotte I.D.	31,000 1	30,000 a, 1	30,000 a	State Water Rights	So. Fork Feather River	2	
					Slate Creek	2	
Richvale I.D.	25,500 1	130,000 a, 1	150,000 1	State Water Rights - Feather River	Cherokee Creek	2	Substitution
Glenn County							
Orland Water Users Assoc.	20,000 7	76,000 7	76,000 7	Orland Project	Stony Creek	4	Export
Glenn-Colusa I.D.	175,000 1	825,000 b, 2	105,000 2	CVP-Ag	Sacramento River	1	Substitution
			720,000 2	State Water Rights	Sacramento Riv. - Stony Crk.	4	
Princeton-Cordora-Glenn I.D.	13,500 1	76,810 b, 2	15,000 2	CVP-Ag	Sacramento River	1	Substitution
			52,810 2	State Water Rights	Sacramento River	3	
Provident I.D.	16,500 1	48,747 c, 2	5,000 2	CVP-Ag	Sacramento River	1	Substitution
			49,730 2	State Water Rights	Sacramento River	3	
Colusa County							
Reclamation District No. 108	52,000 1	212,678 c, 2	33,000 2	CVP-Ag	Sacramento River	1	Substitution
			199,000 2	State Water Rights	Sacramento River	3	
Reclamation District No. 1004		71,400 b, 2	15,000 2	CVP-Ag	Sacramento River	1	Substitution
			56,400 2	State Water Rights	Sacramento River	3	
Colusa Basin Drain M.W.C.		57,637 b, 2	57,637 2	CVP-Ag	Colusa Basin Drain	2	
Proposed Sites Reservoir			Unquantified j	State Water Rights	Sacramento River	5	
Sutter County							
Sutter Extension W.D.	24,000 1	176,000 a, 1	176,000 a, 1	State Water Rights	Feather River	2	
Sutter M.W.C.		245,039 c, 2	95,000 2	CVP-Ag	Sacramento River	1	Substitution
			172,900 2	State Water Rights	Sacramento River	3	
Pleasant Grove-Verona		19,110 c, 2	2,500 2	CVP-Ag	Sacramento River	1	
			23,790 2	State Water Rights	Sacramento R (Pleasant Ck)	2	
Meridian Farm W.C.		29,212 c, 2	12,000 2	CVP-Ag	Sacramento River	1	
			23,000 2	State Water Rights	Sacramento River	3	
Yuba County							
Yuba County W.A.		332,700 5	332,700 5	State Water Rights	Yuba River	2	Substitution
Hallwood I.D.		78,000 5	78,000 5	State Water Rights	Yuba River	2	Substitution
Yolo County							
Woodland Farms/Conaway Ranch		50,862 b, 2	972 2	CVP-Ag	Sacramento River	1	Substitution
			50,190 2	State Water Rights	Sacramento River	3	
Reclamation District No. 999	25,500 1	75,000 a, 1	75,000 a, 1	State Water Rights	Sacramento River	3	Substitution
Delta Lowlands	41,572 h, 6		83,000 i	Riparian	Delta Channels	2	
Sacramento County							
Natomas Central M.W.C.		120,200 b, 2	22,000 2	CVP-Ag	Sacramento River	1	Substitution
			98,200 2	State Water Rights	Sacramento River	3	
City of Sacramento	N/A	166,200	245,000	State Water Rights	American River	2	
			81,800	State Water Rights	Sacramento River	2	
SMUD	N/A	32,131 c, 2	30,000	CVP-M & I	American River	2	
Delta Lowlands	53,548 h, 6		10,700 i	Riparian	Delta Channels	2	
Placer County							
Placer County W.A.		5,000 a, 1	43,000	CVP-Ag	American River	2	
			74,000	CVP-M & I	American River	2	
			120,000	State Water Rights	American River	2	
Proposed Auburn Dam Reservoir			200,000	State Water Rights	American River	5	
Solano County							
Reclamation District No. 2068	13,200 1	45,000 a, 1	45,000 a, 1	State Water Rights	Sacramento River	2	
Delta Lowlands	57,167 h, 6		114,000 i	Riparian	Delta Channels	2	

The identification of a potential water supply source for the purposes of this study does not imply a willingness or an availability of resources on the part of an identified agency or project to develop a transferrable water supply for CCWD.

Exhibit E-13 (Continued)
Potential Water Supply Sources For Contra Costa Water District

Potential Source	Irrigated Acreage (Acres)	Annual Water Use (Acre-Feet)	Surface Water Supplies: Water Rights Entitlement (Acre-Feet)	Rights/Entitlement	Source	Supply Availability	Groundwater: Potential Groundwater Sources	Reclaimed Water: Amount (Acre-Feet)	Reclamation Activity	Discharge Point
Contra Costa County										
Contra Costa W.D.		100,000	195,000	CVP-M & I	Rock Slough	2	Substitution			
			26,700	State Water Rights	Mallard Slough	2				
East Contra Costa I.D.		34,700	50,000	State Water Rights	Indian Slough	2	Substitution			
Byron-Bethany I.D.		40,000	40,000	State Water Rights	Clifton Court Forebay	2				
Delta Lowlands	18,872 h, 6		38,000 i	Riparian	Delta Channels	2				
Proposed Kellogg Reservoir			Unquantified j	State Water Rights	Unregulated Flows - Delta	5				
Sacramento River								26,700	Desalination of Mallard Slough rights	Contra Costa Canal
Mallard Slough								26,700	Desalination of Mallard Slough rights	Contra Costa Canal
Central Contra Costa Sanitary District								50,000	Wastewater Reclamation	CCCSD Wastewater Treatment Plant
Delta Diablo Sanitary District								19,000	Wastewater Reclamation	DDSD Wastewater Treatment Plant
Ironhouse Sanitary District								2,500	Wastewater Reclamation	
Brentwood Sanitary District								2,200	Wastewater Reclamation	
Contra Costa Sanitary District 19								1,300	Wastewater Reclamation	
Byron Sanitary District								100	Wastewater Reclamation	
Mountain View								Unknown	Wastewater Reclamation	
Alameda County										
East Bay M.U.D.		15,000	15,000	CVP-M & I	American River	2				
			15,000	State Water Rights	American River	4				
Bay Area Dischargers	N/A							400,000	Wastewater Reclamation for Agriculture	
San Joaquin County										
Banta Carbona I.D.	20,000 1	50,000 a, 1	25,000 2	CVP-Ag	Delta Mendota Canal	1				
			148,000 1	Riparian Rights	San Joaquin River	2				
South San Joaquin I.D.	72,000 1	300,000 a, 1	300,000 a, 1	State Water Rights	Stanislaus River	2				
Woodbridge I.D.	13,000 1	116,700 a, 1	116,700 a, 1	State Water Rights	Mokelumne River	2				
				State Water Rights	Beaver Slough	2				
City of Tracy								30,000	Wastewater Reclamation	
Delta Lowlands	151,460 h, 6		303,000 1	Riparian	Delta Channels	2				
Delta Storage Reservoirs			Unquantified i	State Water Rights	Delta Channels	5				
Stanislaus County										
Oakdale I.D.	73,000 1	300,000 a, 1	300,000 a, 1	State Water Rights	Stanislaus River	2	Substitution	Unknown	Distribution Facilities Improvements	
Modesto I.D.	103,700 1	154,400 a, 1	154,400 a, 1	State Water Rights	Tuolumne River	2	Substitution			
Turlock I.D.	196,500	400,000 a, 1	400,000 a, 1	State Water Rights	Tuolumne River	2	Substitution			
City of Modesto								27,000	Wastewater Reclamation	
Merced County										
CVP Exchange Contractors San Luis Canal Company Firebaugh Canal Co. Central California I.D.			840,000 2	CVP Exchange, State Water Rights	Delta Mendota Canal	2				
Merced I.D.	143,000 1	570,000 a, 1	570,000 a, 1	State Water Rights	Merced River	2	Substitution	Unknown	Distribution Facility Improvements	
Proposed Los Banos Reservoir			Unquantified j	State Water Rights	Delta	5				
Madera County										
Chowchilla W.D.	65,000 1		24,000 2	CVP-Ag	Buchanan Dam	2	Substitution			
			55,000 2	CVP-Ag Class I	Madera Canal	2				
			160,000 2	CVP-Ag Class II	Madera Canal	4				
Madera I.D.	116,800 1	135,000 a, 1	85,000 2	CVP-Ag Class I	Madera Canal	2	Subsitution			
			186,000 2	CVP-Ag Class II	Madera Canal	4				
			Unknown	State Water Rights	San Joaquin River	2				
			Unknown	State Water Rights	Fresno River	2				
Kern County										
Berrenda Mesa W.D.	49,900 1	130,000 a, 1	155,100 4	SWP-Ag	SWP - California Aqueduct	1				

The identification of a potential water supply source for the purposes of this study does not imply a willingness or an availability of resources on the part of an identified agency or project to develop a transferrable water supply for CCWD.

Notes/Footnotes

a Annual water use
b Contract entitlement
c Maximum historical delivery
d Solano County Conservation and Flood Control District
e Irrigation of water fowl habitat and native pasture
f Agricultural drain water collected and disposed
g Ten-year average annual diversion
h Annual crop acreage
i Based on crop consumptive use of 2.0 feet
j Annual yield of new reservoir is not projected

1 ACWA's 75 Year History
2 USBR contract sheet
3 Map--Boundaries of Public Water Agencies--San Joaquin Valley 1993 - DWR
4 Contract specific to agency sited
5 Based on previous, unpublished, B-E work for Yuba County Water Agency
6 DWR December 1993
7 USBR Facts Sheet

Supply Availability

1 Agricultural supply, availability primarily during irrigation season specific to crop type or contract.
2 Base water supply, available in all years subject to water shortage conditions.
3 CVP base supply, available primarily between April and October.
4 Wet year supply only.
5 Availability dependant on hydrological conditions.

Exhibit E-14
Comparison of Principal Transfer Considerations by Water Source

Transfer Considerations	Central Valley Project Water	Other Appropriated Water	Groundwater	Reclaimed Water
Seasonal Distribution	Irrigation season; some CVP "irrigation" contracts allow M & I use	Irrigation season for direct diversion rights; year-round for storage releases	Year-round	Year-round
Dry Year Availability	Subject to irrigation contract shortages	Depends on seniority rights and/or CVP/SWP/other contract terms	Available	Available
Regulation Mechanism	Conjuctive use with groundwater; groundwater banking, directly or by exchange	Conjunctive use with groundwater; groundwater banking, directly or by exchange	Not needed	Not needed
Transfer Pathway to CCWD from Out of District Sources	Natural channels if supply from north of Delta, but with Delta carriage water assessment; divert from Delta if supply from south of Delta	Natural channels if supply from north of Delta but with Delta carriage water assessment; need to exchange purchased water for south of Delta transfer with CVP or SWP contractor supplied from the Delta	Natural channels if supply from north of Delta but with Delta carriage water assessment; for south of Delta transfer, need to exchange purchased water with CVP or SWP contractor supplied	Natural channels if supply from north of Delta but with Delta carriage water assessment; for south of Delta transfer, need to exchange purchased water with CVP or SWP contractor supplied from the Delta
Institutional	Contract under provisions of CVPIA; CCWD has first right of refusal against a non-CVP purchaser	Need SWRCB approval on post-1914 water rights; may need contracts with third parties for banking and/or wheeling. SWRCB can validate pre-1914 rights, but not required	No approval by SWRCB required; may need third party wheeling contract	Likely need Regional WQCB discharge permit; may need diversion and place of use permit from SWRCB, but not for effluent from groundwater sources
"Real Water"	Transfer amount limited to net consumptive use and irretrievable losses	Transfer amount limited to net consumptive use if supply is from crop shift or fallowing; if from surface storage, transfer amount could be discounted by storage refill impacts on others	Total pumpage unless discounted for refill impacts	Total quantities, if no injury to other user

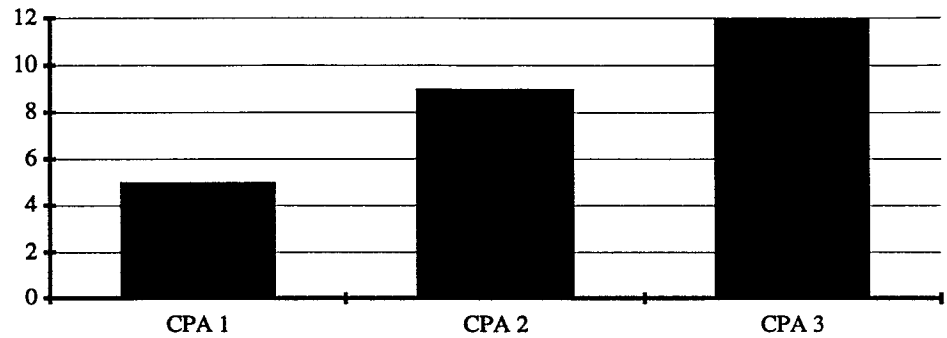
Generally, the CPAs differ by relative savings achieved, voluntary versus mandatory controls, relative costs, reliability, technical feasibility and ease of implementation. The reliability and ease of implementation of the programs decrease as the level of effort increases. The DWR, the California Urban Water Conservation Council (CUWCC) and other agencies have all noted difficulties implementing more intensive conservation measures. Aggressive conservation programs may also be accompanied by a general hardening of demand, thereby reducing customers' ability to respond to future water shortages. Exhibit E-15 illustrates the savings anticipated from each of the CPAs.

Conservation Program Alternative 1. CPA 1 is an expansion of the District's current conservation efforts to encompass its wholesale as well as retail customers. It is consistent with currently mandated BMPs and achieves an overall District-wide reduction of 5% in the year 2040.

Conservation Program Alternative 2. CPA 2 is similar to CPA 1 but with higher coverage and participation levels; CPA 2 achieves an overall District-wide reduction of 9% in the year 2040. It requires considerable effort from CCWD and its customers. In CPA 2, the burden of responsibility for savings shifts, to a large extent, from CCWD to its customers. CCWD increases the coverage associated with the conservation measures, but customers are expected to achieve greater savings after exposure to the measures.

Conservation Program Alternative 3. CPA 3 is the most aggressive conservation program, with very high coverage and participation levels. It achieves an overall District-wide reduction of 12% in the year 2040. It places a large burden on CCWD and its customers and is considered the least reliable alternative due to the high coverage requirements and the resulting demand hardening. CPA 3 introduces rate structure changes and efficiency standards for commercial and industrial processes. It results in double-digit conservation savings from all customer categories except Major Industrial.

Exhibit E-15
Anticipated Savings for Conservation Program Alternatives



INITIAL EVALUATION OF THE RESOURCE ALTERNATIVES

RESOURCES PLANNING

E-22

Since the existing CVP supply contract, even when coupled with demand management, will not meet all future needs; a resource plan that includes a mix of components is required. Integrated Resources Planning ensures that increasing demand is met with a balanced mix of individual demand-side management and supply-side options. To consider a range of potential resources and achieve the most appropriate and reliable supply, the District's resource planning must be flexible and provide for evolution over time. The District developed Resource Alternative strategies to meet normal and drought year demands in Service Areas C, E, and F for the three planning targets, 2000, 2020 and 2040.

EVALUATION PROCESS

Resource Alternatives were developed and screened in two separate rounds. Round 1 developed three Resource Alternatives that each emphasized one of three resource strategies: New Supply, Reclamation and Conservation. Additionally, the Round 1 Resource Alternatives reflect the implications of varying supply sources on the District's CVP supply during dry years. The District assembled the most promising components identified in Round 1 to develop Round 2 Resource Alternatives.

The District evaluated the Round 1 Resource Alternatives based on the cost, reliability, environmental and implementability criteria summarized earlier in this document.

There is a higher demand for CCWD supplies during a drought year, because some of the demands within the Service Area may be met through other supplies (water diversions) in normal and wet years, which are unavailable during dry years.

Development of Resource Categories and Components

The District's existing supplies and potential demand management and supply options were defined as potential components of Resource Alternatives. Resource Alternatives are combinations of supply and demand management options which together can meet CCWD's future water needs. Exhibit E-16 identifies the resource categories and components that were used as building blocks for the Round 1 Resource Alternatives.

Exhibit E-16
Resource Categories and Components

Resource Category	Component
Water Supply	• CVP Water • Surface Water Transfers/Groundwater Export • Water Banking/Storage • Desalination
Conservation	• Conservation Program Alternative 1 • Conservation Program Alternative 2 • Conservation Program Alternative 3
Reclamation	• Agricultural Irrigation East County (8,800 ac-ft/yr) • Urban Irrigation Central County (3,800 ac-ft/yr) Pittsburg/Antioch (5,940 ac-ft/yr) East County (5,800 ac-ft/yr) • Industrial Process Use Shell/Tosco (25,300 ac-ft/yr) USS-POSCO/Dow/Gaylord Industrial Process Use (10,100 ac-ft/yr)

Round 1 Alternatives

The combinations of components included in each of the three Resource Alternatives, for normal and drought year conditions, are described in the following sections and shown in Exhibits E-17 through E-19 for the years 2000, 2020 and 2040.

New Supply Emphasis. The New Supply emphasis maximizes surface water transfers/rights and desalination. The significant increase in needed supplies within each demand scenario for the drought conditions reflects the potential decrease in CVP supply. Most of the supply need was met with surface water transfers, and the remainder with the maximum quantity of desalination at Mallard Slough and a moderate level of conservation (CPA 1). Exhibit E-20 illustrates the method used to calculate the surface water transfers required for Service Area C in the year 2000.

Exhibit E-17
Resource Alternatives - Round 1

Year 2040

Year 2020

Year 2000

Service Area Alternatives	THEMES: New Supply Emphasis	Reclamation Emphasis	Conservation Emphasis
C **176 TAF**	**Drought/Normal** • CVP[1] (132/176 TAF) • Surface Water Transfers/Rights (18-44 / 0 TAF)	**Drought/Normal** • CVP (122/163 TAF) • Industrial Process Use (12 / 12 TAF) • Central County Urban (1 / 1 TAF) • Surface Water Transfers/Rights (15-41 / 0 TAF)	**Drought/Normal** • CVP (128/171 TAF) *[Conservation Program 3 (5/5 TAF)]* • Surface Water Transfers/Rights (17-43 / 0 TAF)
E **185 TAF**	• CVP (139/185 TAF) • ECCID Transfer (9/0 TAF) • Surface Water Transfers/Rights (9-37 / 0 TAF)	• CVP (129/172 TAF) • Industrial Process Use (12 / 12 TAF) • Central County Urban (1 / 1 TAF) • ECCID Transfer (9/0 TAF) • Surface Water Transfers/Rights (8-34/ 0 TAF)	• CVP (134/179 TAF) *[Conservation Program 3 (6/6 TAF)]* • ECCID Transfer (9/0 TAF) • Surface Water Transfers/Rights (9-36 / 0 TAF)
F **194 TAF**	• CVP (146/194 TAF) • ECCID Transfer (9/0 TAF) • Surface Water Transfers/Rights (10-39 / 0 TAF)	• CVP (136/181 TAF) • Industrial Process Use (12 / 12 TAF) • Central County Urban (1 / 1 TAF) • ECCID Transfer (9/0 TAF) • Surface Water Transfers/Rights (9-36/ 0 TAF)	• CVP (141/188 TAF) *[Conservation Program 3 (6/6 TAF)]* • ECCID Transfer (9/0 TAF) • Surface Water Transfers/Rights (10-38 / 0 TAF)

1. "CVP supplies" referred to in a normal year encompass CVP supplies and other supplies if available, but the District must be prepared to meet the full amount in any year.

Exhibit E-18
Resource Alternatives - Round 1

Year 2040

Year 2020

Service Area Alternatives	THEMES: New Supply Emphasis	Reclamation Emphasis	Conservation Emphasis
C **210 TAF**	**Drought/Normal** • CVP[1] (163/195 TAF) • Surface Water Transfers/Rights (15-47 / 15 TAF)	**Drought/Normal** • CVP (128/171 TAF) • Industrial Process Use (35 / 35 TAF) • Central County Urban (4 / 4 TAF) • Surface Water Transfers/Rights (12-43 / 0 TAF)	**Drought/Normal** • CVP (137/183 TAF) *[Conservation Program 3 (27 / 27 TAF)]* • Surface Water Transfers/Rights (15-46 / 0 TAF)
E **237 TAF**	• CVP (163/195 TAF) • ECCID Transfer (21 / 21 TAF) • SurfaceWater Transfers/Rights (17-53 / 21 TAF)	• CVP (149/195 TAF) • Industrial Process Use (35 / 35 TAF) • Central County Urban (4 / 4 TAF) • ECCID Transfer (13-21 / 3 TAF) • Surface Water Transfers/Rights (0-28 / 0 TAF)	• CVP (155/195 TAF) *[Conservation Program 3 (31 / 31 TAF)]* • ECCID Transfer (15 / 11 TAF) • Surface Water Transfers/Rights (0-30 / 0 TAF)
F **273 TAF**	• CVP (153/195 TAF) *[Conservation Program 1 (8/8 TAF)]* • Mallard Slough Desalination (10 / 22 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfer/Banking (40-81 / 27 TAF)	• CVP (163/195 TAF) *[Conservation Program 1 (8/8 TAF)]* • Industrial Process Use (35 / 35 TAF) • Central County Urban (4 / 4 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (1-42 / 10 TAF)	• CVP (163/195 TAF) *[Conservation Program 3 (35 / 35 TAF)]* • ECCID Transfers (21 / 21 TAF) • Surface Water Transfers/Rights (13 - 54 / 22 TAF)

1. "CVP supplies" referred to in a normal year encompass CVP supplies and other supplies if available, but the District must be prepared to meet the full amount in any year.

Exhibit E-19
Resource Alternatives - Round 1

Year 2040

Service Area Alternatives	THEMES: New Supply Emphasis	Reclamation Emphasis	Conservation Emphasis
C **217 TAF**	**Drought/Normal** • CVP[1] (153/195 TAF) • Mallard Slough Desalination (10 / 22 TAF) • Surface Water Transfers/Rights (21-54 / 0 TAF)	**Drought/Normal** • CVP (134/178 TAF) • Industrial Process Use (35 / 35 TAF) • Central County Urban (4 / 4 TAF) • Surface Water Transfers/Rights (11-44 / 0 TAF)	**Drought/Normal** • CVP (141/188 TAF) *[Conservation Prog. 3 [29 / 29TAF)]* • Surface Water Transfers/Rights (14-47 / 0 TAF)
E **248 TAF**	• CVP (153/195 TAF) • Mallard Slough Desalination (10 / 22 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (27- 64 / 10 TAF)	• CVP (152/195 TAF) • Industrial Process Use (35 / 35 TAF) • Central County Urban (4 / 4 TAF) • East County Ag. (6 / 6 TAF) • ECCID Transfer (14-21 / 8 TAF) • Surface Water Transfers/Rights (0-30 / 0 TAF)	• CVP (161/195 TAF) *[Conservation Prog. 3 (34 / 34 TAF)]* • ECCID Transfer (17-21 / 21 TAF) • Surface Water Transfers/Rights (0-33 / 0 TAF)
F **297 TAF**	• CVP (153/195 TAF) *[Conservation Prog. 1 (12/12 TAF)]* • ECCID Transfer (21 / 21 TAF) • Mallard Slough Desalination (10 / 22 TAF) • Surface Water Transfer/Banking (56-101 / 47 TAF)	• CVP (163/195 TAF) *[Conservation Prog. 1 (12/12 TAF)]* • ECCID Transfer (21 / 21 TAF) • Industrial Process Use (35 / 35 TAF) • East County Ag. (10 / 10 TAF) • Central County Urban (4 / 4 TAF) • Surface Water Transfers/Rights (7-52 / 20 TAF)	• CVP (163/195 TAF) *[Conservation Prog. 3 (41 / 41 TAF)]* • ECCID Transfers (21 / 21 TAF) • Surface Water Transfers/Rights (34-72 / 40 TAF)

1. "CVP supplies" referred to in a normal year encompass CVP supplies and other supplies if available, but the District must be prepared to meet the full amount in any year.

Exhibit E-20
New Supply Conditions

Year 2000 - Service Area C

Projected Demand: 176 TAF
- High End of Demand Envelope: 188 TAF
- Low End of Demand Envelope: 167 TAF

New Supply Emphasis
- Surface Water Transfers
- Surface Water Rights (New)

To Meet Demand of:	100%		85%	
Water Year Type	Normal	Drought	Drought	
Base Demand (TAF)	176	176	176	
Acceptance of Short-term Demand Management During Drought:			-26	(15% of 176)
Target Demand	176	176	150	(85% of 176)
Supply				
CVP	176	132	132	(75% of 176)
Surface Water Transfer	0	44	18	
Totals	176	176	150	(85% of 176)

Note: All figures in Thousand Acre-Feet (TAF).

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Reclamation Emphasis. The Reclamation emphasis meets projected demand using the greatest quantity of recycled water feasible. Potential categories for reclamation projects include Agricultural Irrigation, Urban Irrigation and Industrial Use. Exhibit E-21 shows the maximum feasible type of reclamation water for each of the three planning dates.

Exhibit E-21
Maximum Reclamation Supply

Potential Category	**2000**	**2020**	**2040**
Agricultural Irrigation	0	0	6-10 TAF
Urban Irrigation	1 TAF	4 TAF	4 TAF
Industrial Use	12 TAF	35 TAF	35 TAF
Total	**13 TAF**	**39 TAF**	**45-49 TAF**

Surface water transfers were added in this emphasis to supplement reclamation supplies during drought years. Exhibit E-22 illustrates the method for calculating surface water transfers required in addition to recycled water projects.

Conservation Emphasis. CPA 3, the most aggressive program, was used to analyze the Resource Alternative focused on conservation. The impact of this program in the short term (i.e., the year 2000) was found to be minimal. Exhibit E-23 shows the maximum long-term demand reduction levels for CPA 3.

C—100472

C-100472

Exhibit E-22
Reclamation Calculations

Year 2000 - Service Area C

Projected Demand: 176 TAF
- High End of Demand Envelope: 188 TAF
- Low End of Demand Envelope: 167 TAF

Reclamation Emphasis

- Industrial Process Use - (Shell/Tosco) Cooling Towers Only (12 TAF)
- Central County Urban Irrigation (1 TAF)

To Meet Demand of:	100%		85%	
Water Year Type	Normal	Drought	Drought	
Base Demand (TAF)	176	176	176	
Reclamation	-13	-13	-13	
	163	163	163	
Acceptance of Short-term Demand Management During Drought:			-26	(15% of 176)
			137	
Target Demand	163	163	137	
Supply				
CVP	163	122	122	(75% of 163)
Surface Water Transfer	0	41	15	
Totals	163	163	137	

Note: All figures in Thousand Acre-Feet (TAF).

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Exhibit E-23
Estimated Long-Term Conservation for CPA 3

Service Area	2000 *	2020	2040
C	5 TAF	27 TAF	29 TAF
E	6 TAF	31 TAF	34 TAF
F	6 TAF	35 TAF	41 TAF

* Assumes full recovery from 1991 drought reductions.

Savings achieved through conservation are generally cost effective. Due to the District's amended CVP contract, conservation results in less CVP water allocated in times of shortages, resulting in a marginal reduction in the need for additional supplies. Note that when demand exceeds CVP supplies, conservation has no bearing on the drought supplies from the CVP and becomes added, instead of substituted supply. However, unlike reclamation projects, the costs of reducing the demand, in the long-term, are less than the District's cost of purchasing CVP water. One potential concern is the inherent uncertainty in predicting conservation savings especially at extreme levels. Demand hardening can diminish the ability to achieve savings over the long-term. Exhibit E-24 illustrates the method for calculating surface water transfers required in addition to conservation projects.

GROUPING OF THE RESOURCE ALTERNATIVES FOR ROUND 1 EVALUATION

The evaluation process was simplified by recognizing similarities in the Resource Alternatives developed to solve for the nine possible normal year demand scenarios (resulting from the combinations of the three service areas and the three target planning dates). Although there were nine separate demand scenarios for which potential Resource Alternatives were developed in Round 1, it was determined unnecessary to evalu-

Exhibit E-24
Conservation Calculations

Year 2000 - Service Area C

Projected Demand: 176 TAF
- High End of Demand Envelope: 188 TAF
- Low End of Demand Envelope: 167 TAF

Conservation Emphasis

- Conservation Program 3 (5 TAF)
  (5% Program 3 - 2% (No Action) = 3% conservation

To Meet Demand of: Water Year Type	100% Normal	100% Drought	85% Drought	
Base Demand (TAF)	176	176	176	
Conservation	-5	-5	-5	(3% of 176)
	171	171	171	
Acceptance of Short-term Demand Management During Drought:			-26	(15% of 171)
Target Demand	171	171	145	
Supply				
CVP	171	128	128	(75% of 171)
Surface Water Transfer	0	43	17	
Totals	171	171	145	(85% of 171)

Note: All figures in Thousand Acre-Feet (TAF).

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ate each separately since there were minimal differences in the additional supplies required among some demand scenarios. Therefore the District evaluated only the five demand scenarios listed below:

Service Area C, E and F	Year 2000
Service Area C and E	Year 2020
Service Area F	Year 2020
Service Area C and E	Year 2040
Service Area F	Year 2040

DETERMINING THE MOST PROMISING COMPONENTS

The goal of Round 1 was to identify the most promising components, which would then be combined to form improved, more balanced Resource Alternatives during Round 2. Based on the Round 1 evaluation, the most promising components for integration into the Round 2 Resource Alternatives were CVP water, surface water transfers, groundwater export, conservation and reclamation.

Desalination, to maximize the District's existing Mallard Slough water right, was tested in the New Supply emphasis and appears to have only marginal benefits. The benefit of desalination was outweighed by its high energy costs, high construction costs, brine disposal and lack of flexibility.

Conservation has the maximum benefit over the long-term. Therefore, all Resource Alternatives should use some level of conservation. However, no matter what additional conservation and/or reclamation programs are implemented, in the short term the District will still require a water transfer of between 15 to 44 TAF during a dry year. The District's options are:

- Purchase transfers only in dry years, thereby lessening reliability.
- Purchase transfers and bank them every year, thereby increasing both reliability and cost.
- Purchase options to be exercised in drought years.

KEY CRITERIA

In addition to identifying the most promising supply and conservation components to carry forward into the Round 2 analysis, the Round 1 evaluation revealed that certain criteria best distinguish the various Resource Alternatives. That is, although all 12 criteria are considered important, it was found that five key criteria best distinguished the benefits of the Resource Alternatives:

- O1: Minimize water shortages in frequency and magnitude,
- O2: Maximize water reliability,
- Ec1: Minimize life-cycle costs,
- Ec2: Minimize rate impacts to customers, and
- I3: Ensure proper timing and phasing.

SCREENING OF THE RESOURCE ALTERNATIVES AND SELECTION OF THE PREFERRED ALTERNATIVE

DESCRIPTION OF THE ROUND 2 RESOURCE ALTERNATIVES

During Round 2, the District developed, analyzed and screened six Resource Alternatives. The six Resource Alternatives integrated larger levels of conservation and reclamation as the alternatives move from 1 to 6. The goal of the Round 2 process was to evaluate Resource Alternatives comprised of the most promising components from Round 1 while continuing to integrate flexibility into the development of future supplies. It was determined that Round 2 Resource Alternatives should focus on the year 2020, with the District developing implementation strategies focused on 5- to 10-year increments for the phasing of projects.

The six Resource Alternatives are described below and illustrated in Exhibit E-25.

Resource Alternative 1. Resource Alternative 1 relies on a minimal level of conservation and includes no reclamation projects. Primary reliance is on the purchase of surface water transfers (38 TAF in a normal year for Service Area C) to supplement the reduced CVP allocation which would occur by 2010. Spot transfers would be used to meet demand during a drought. Since 78 TAF of transfer water would be required in Service Area F in a normal year, water banking was included as a component for that Service Area.

Resource Alternative 2. Resource Alternative 2 is very similar to Resource Alternative 1 but includes an intermediate level of conservation (CPA 2), thereby requiring less surface water transfers (31 TAF in a normal year for Service Area C) to meet projected demand. Spot transfers would supplement supply during a drought. Banking was included for Service Area F only.

Resource Alternative 3. Resource Alternative 3 maintains an intermediate level of conservation (CPA 2) and introduces a low level of reclamation, 5 TAF for Service Area C. The addition of an agricultural irrigation reclamation project in East County for Service Areas E and F would achieve an additional 5 TAF by the year 2020. Surface water transfers required would be less than those for the previous two Resource Alternatives, with approximately 26 TAF required for Service Areas C and E. Spot transfers would be used to supplement drought supplies. Banking was included for Service Area F only.

Resource Alternative 4. Resource Alternative 4 includes the same intermediate level of conservation as Resource Alternatives 2 and 3, but includes the highest level of reclamation of all the Resource Alternatives. The anticipated reclamation projects would include Shell and Tosco cooling towers and boiler feed water, in addition to urban irrigation projects, for a total of 30 TAF by the year 2020. Agricultural irrigation projects in the East County were added for Service Areas E and F. Surface water transfers, as a result, are reduced to almost zero during a normal year in Service Areas C and E, and down to 35 TAF in Service Area F. Spot transfers would be used to supplement drought supplies. Banking was included as a component for Service Area F only.

Resource Alternative 5. Resource Alternative 5 combines the highest level of conservation (CPA 3) with surface water transfers. Transfers for Service Areas C and E would range from 17 to 19 TAF in a normal year, and increase to 51 TAF in Service Area F.

C-100476

Exhibit E-25
Resource Alternatives - Round 2

Year 2020
(with Assumed CVPIA Reductions of 15%)

Service Area Alternatives	ALTERNATIVES 1	2	3
C 210 TAF	**Drought/Normal** • CVP[1] (140/166 TAF) • *[CPA 1 (6 / 6 TAF)]* • Surface Water Transfers/Rights (33-64 / 38 TAF)	**Drought/Normal** • CVP (140/166 TAF) • *[CPA 2 (13 / 13 TAF)]* • Surface Water Transfers/Rights (26-57 / 31 TAF)	**Drought/Normal** • CVP (140/166 TAF) • *[CPA 2 (13 / 13 TAF)]* • Reclamation (5 / 5 TAF) • Surface Water Transfers/Rights (21-52 / 26 TAF)
E 237 TAF	• CVP (140/166 TAF) • *[CPA 1 (7 / 7 TAF)]* • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (33-69 / 43 TAF	• CVP (140/166 TAF) • *[CPA 2 (14 / 14 TAF)]* • ECCID Transfer (21 / 21 TAF) • SurfaceWater Transfers/Rights (26-62 / 36 TAF)	• CVP (140/166 TAF) • *[CPA 2 (14 / 14 TAF)]* • Reclamation (10 / 10 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (16-52 / 26 TAF)
F 273 TAF	• CVP (140/166 TAF) • *[CPA 1 (8 / 8 TAF)]* • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (63-104 / 78 TAF) • Banking	• CVP (140/166 TAF) • *[CPA 2 (16 / 16 TAF)]* • ECCID Transfers (21 / 21 TAF) • Surface Water Transfer/Banking (55-96 / 70 TAF) • Banking	• CVP (140/166 TAF) • *[CPA 2 (16 / 16 TAF)]* • Reclamation (10 / 10 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (45-86 /60 TAF) • Banking

1. "CVP supplies" referred to in a normal year encompass CVP supplies and other supplies if available, but the District must be prepared to meet the full amount in any year.

Exhibit E-25 (Continued)
Resource Alternatives - Round 2

Year 2020

(with Assumed CVPIA Reductions of 15%)

Service Area Alternatives	ALTERNATIVES 4	5	6
C 210 TAF	**Drought/Normal** • CVP (140/166 TAF) • *[CPA 2 (13 / 13 TAF)]* • Reclamation (30 / 30 TAF) • Surface Water Transfers/Rights (0-27 / 1 TAF)	**Drought/Normal** • CVP (140/166 TAF) • *[CPA 3 (27 / 27 TAF)]* • Surface Water Transfers/Rights (12-43 / 17 TAF)	**Drought/Normal** • CVP (140/166 TAF) • *[CPA 3 (27 / 27 TAF)]* • Reclamation (17 / 17 TAF) • Surface Water Transfers/Rights (0-26 / 0 TAF)
E 237 TAF	• CVP (140/166 TAF) • *[CPA 2 (14 / 14 TAF)]* • Reclamation (35 / 35 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (0-27 / 1 TAF)	• CVP (140/166 TAF) • *[CPA 3 (31 / 31 TAF)]* • ECCID Transfer (21 / 21 TAF) • SurfaceWater Transfers/Rights (9-45 / 19 TAF)	• CVP (140/166 TAF) • *[CPA 3 (31 / 31 TAF)]* • Reclamation (22 / 22 TAF) • ECCID Transfer (21 / 21 TAF) • SurfaceWater Transfers/Rights (0-23 / 0 TAF)
F 273 TAF	• CVP (140/166 TAF) • *[CPA 2 (16 / 16 TAF)]* • Reclamation (35 / 35 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfers/Rights (20-61 /35 TAF) • Banking	• CVP (140/166 TAF) • *[CPA 3 (35 / 35 TAF)]* • ECCID Transfer (21 / 21 TAF) • Surface Water Transfer/Banking (36-77 / 51 TAF) • Banking	• CVP (140/166 TAF) • *[CPA 3 (35 / 35 TAF)]* • Reclamation (22 / 22 TAF) • ECCID Transfer (21 / 21 TAF) • Surface Water Transfer/Banking (14-55 /29 TAF) • Banking

Spot transfers would be used to supplement drought supplies. A banking component has been included only for Service Area F.

Resource Alternative 6. Resource Alternative 6 was initially created to maximize both conservation and reclamation components. This Resource Alternative was modified to integrate the highest level of conservation (CPA 3) with an intermediate level of reclamation (17 to 22 TAF). During a drought year, this combination would limit transfers to between 23 to 26 TAF for Service Areas C and E and would eliminate the need for a transfer in a normal year. Service Area F would still require a water transfer of 29 TAF during a normal year, and between 14 to 55 TAF in a drought year, therefore banking was included.

ROUND 2 EVALUATION

The approach for Round 2 was to evaluate the Resource Alternatives with an emphasis on life-cycle costs, while also considering the reliability and implementability criteria. Cost projections focused on Service Area C, with incremental costs for Service Areas E and F examined in less detail. The final criterion (Ec2 - Rates) was applied to the three most viable Resource Alternatives from the Round 2 evaluation as part of identifying the Preferred Alternative.

The team focused on Service Area C for two primary reasons. First, this Service Area encompasses the District's existing Service Area and the planning area of existing customers. At this point in time, the District can only make decisions based on demand within that area. Second, the mix of components within Service Areas C, E and F differs by quantity, but not in the combination of components. Although the ranking of Resource Alternatives may differ in magnitude among the Service Areas, the relative ranking between Resource Alternatives remains the same, allowing the team to narrow its focus to Service Area C.

The key components of each Alternative (e.g., transfers, reclamation and conservation) were evaluated on the basis of the key criteria (reliability, implementability and cost). Results of the Round 2 analysis are summarized below.

Evaluation of Reliability

Resource Alternatives were evaluated and ranked based on their technical reliability. Technical reliability refers to the reliability of infrastructure and facilities, such as pumps, pipelines, reverse osmosis treatment, and ULF toilets. This category was used to rate the components in terms of facilities, operations and the ability to achieve the desired supply, including during a drought. Drought reliability was also considered later, primarily in the examination of flexibility and feasibility of the three conservation programs.

Transfers are the most technically reliable because they are compatible with the District's existing facilities, operations and infrastructure. Reclamation is considered technically less reliable because it is more prone to facility complexities; however, technology should improve in the future. Reclamation components with lower demands and requiring less treatment rated higher. Conservation is considered technically reliable; however, problems of customer acceptance and retention decrease reliability at more aggressive levels.

Reliability during drought periods, or the impact on various components during dry years, is another consideration. Reclamation, for example, has strong appeal during a drought due to the relative consistency of source water. Surface water transfers have a high degree of technical reliability and a lower degree of drought reliability due to the increased pressure on supplies. Transfers were assumed to be obtainable by the District through a spot transfer during a drought, acknowledging the higher cost.

Conservation is the component most potentially affected during drought. Conservation hardens demand at higher levels, which reduces the customers' ability to respond to drought shortages. A lengthy drought would affect the District's reliability for maintaining the levels of savings associated with CPA 3.

Based on this assessment of reliability, Resource Alternatives 1 and 2 rated High due to their emphasis on the use of transfers. Resource Alternative 3 rated slightly lower due to the reduced levels of transfers and the introduction of reclamation. Resource Alternatives 4, 5 and 6 rated Low on reliability due to the combination of high levels of reclamation and conservation, and the potential impact of demand hardening in Resource Alternatives 5 and 6. Ratings are summarized in Exhibit E-26.

Exhibit E-26
Evaluation of Reliability

Alternative	1	2	3	4	5	6
Rating:	HIGH	HIGH	MOD.	LOW	LOW	LOW

Evaluation of Implementability

Implementability was evaluated based on the complexity of implementing and permitting, as well as a project's institutional requirements. Factors examined include the number of approvals required, the permitting process, construction and environmental constraints, agency interaction, contracting and negotiations, and expected length of the planning process. The more complex and the larger the number of agencies and approvals required, the lower the implementability score. Agencies within the District and local contracts were viewed more favorably. State and Federal contracts can increase complexity and implementation time. For these reasons, in reviewing this criterion, water transfers were perceived as the most complex component to develop based on the complexity of negotiations and the number of agency approvals required. Resource Alternatives that incorporate higher levels of transfers scored lower for this criterion.

Minimal implementation hurdles are anticipated for Reclamation components. Reclamation would require contracting with treatment agencies and users; however, most would be local agencies with which the District has existing contracts. Conservation would be easier to implement at less aggressive levels and would require the least interaction with other agencies.

Resource Alternatives 1, 2 and 3 rated Moderate based on their reliance on water transfers during normal and dry years. Resource Alternative 4 ranked as the most implementable, as minimal normal year transfers are required and all components would be held within the District's service area. Resource Alternatives 5 and 6 scored low for implementability primarily based on the inclusion of CPA 3. Ratings are summarized in Exhibit E-27.

Exhibit E-27
Evaluation of Implementability

Alternative	1	2	3	4	5	6
Rating:	MOD.	MOD.	MOD.	HIGH	LOW	LOW

Evaluation of Cost

Economics were evaluated with an analysis of life-cycle costs based on present worth. While the evaluation focused on the year 2020, cost projections spanned the period 1997 to 2040. The cost methodology factored in the timing and phasing of the Resource Alternatives' various components, including capital, operating and maintenance costs. The present worth methodology facilitated rating components, phased in over time, on a common scale against the criteria.

Estimates for implementation costs include consideration of construction, engineering, environmental mitigation, permitting and legal/institutional costs. Present worth costs for the components were calculated based on the period from 1997 to 2040. Reclamation costs ranged depending on year of implementation, as indicated below.

Component	Present Worth Cost ($ per ac-ft)
CVP water	$38
Conservation - CPA 1	$ 161
Conservation - CPA 2	$ 113
Conservation - CPA 3	$ 93
Reclamation	
Project 1 (Central County Urban)	$ 590-631
Project 2 (Antioch Urban)	$ 511-527
Project 3 (Cooling Towers)	$ 431-625
Project 4 (Boiler Feed Water)	$1,087
Surface Water Transfer	$ 198[4]
Spot Surface Water Transfer	$ 340[4]
ECCID Surface Water Transfer	$63

Present worth costs were used to compare and rank the Resource Alternatives. Costs are presented in detail for Service Area C. Present worth costs for the Resource Alternatives range between $265 million and $831 million dollars, as shown in Exhibit E-28. Resource Alternative 4 was the highest cost Resource Alternative based on its reliance on higher levels of reclamation that require extensive treatment[5]. Resource Alternative 5 ranked as the lowest cost, reflecting the long-term cost effectiveness of conservation due to the increased water savings each year. Resource Alternatives 1, 2 and 3 and 5 formed a reasonable cost range between $265 million to $339 million. Resource Alternative 6 fell above this range with a projected cost of $454 million, at least 34% higher than the highest of the other four alternatives. Due to the availability of surface water transfers from ECCID with Service Area E, there are no significant differences between the Resource Alternative components for Service Area C and E; this implies that selecting a Resource Alternative now for Service Area C will not preclude future expansion of the service area.

4 These 1997 Present Worth costs have been estimated as a high end scenario. Costs were based on $50 to $175 per ac-ft annually for long-term surface water transfers and $125 to $300 for spot transfers required in drought years, including $40 to $50 ac-ft for pumping and in-Delta restoration charges.

5 Since the original analysis, Shell/Tosco representatives have recently expressed the potential need for higher quantities of cooling tower water, which could result in lowering the cost of this Alternative by approximately 20% (cooling tower unit costs are less than that of boiler feed water). However, this would still represent a cost of approximately two times the cost range determined to be reasonable for the District. Since this component was not studied for implementation until the year 2011, this opportunity will be given further consideration and study within future updates of the FWSS.

Exhibit E-28
Evaluation of Present Worth Costs
(in millions of dollars)

Alternative	1	2	3	4	5	6
Cost:	$336	$309	$339	$831	$265	$454

PRELIMINARY RANKING OF THE ROUND 2 RESOURCE ALTERNATIVES

Exhibit E-29 displays the preliminary rankings for the six Resource Alternatives. The top block identifies the key components of each Alternative. The rankings are then shown (High, Medium or Low), indicating how each Alternative responded to the key criteria. Preliminary examination of the rankings for each Resource Alternative shows that Resource Alternatives 1 and 2 scored the lowest (most favorable) and Resource Alternative 3 ranked third. Resource Alternatives 4 and 5, representing the most and least costly Resource Alternatives, ranked next. Resource Alternative 6 ranked poorly with two Low ratings for implementability and reliability.

Based on these preliminary rankings, the District advanced a "shortlist" of the three most promising Resource Alternatives, shown on the left half of Exhibit E-30, for a more detailed examination as part of Round 2.

FURTHER EVALUATION OF THE RESOURCE ALTERNATIVES

Evaluation of the remaining three Resource Alternatives (i.e., 1, 2 and 3) focused on rate impacts, as well as the trade-offs between reliability, costs and implementability. Based on results of this more detailed analysis, the District identified a Preferred Alternative with the widest acceptability. The Preferred Alternative will ensure flexibility in responding to changing demand relative to project implementation, phasing and schedules.

Delivery Assumptions

Earlier overall assumptions regarding delivery scenarios remained the same during the further evaluation of Round 2 Resource Alternatives. A 15% reduction in CVPIA supplies during a normal year and further reductions during drought were assumed to occur in the year 2010, sharply increasing the need for water.

Conservation and Reclamation Components

CPAs 1 and 2 were included as components of all three remaining Resource Alternatives. CPAs 1 and 2 would reduce 2040 water use by 5 and 9%, respectively. A water reclamation component is included in Resource Alternative 3 and was slightly increased (by 1.7 TAF) from the preliminary evaluation to provide a drought-proof supply equal to 15% of demand for cooling tower make-up by industrial users.

Exhibit E-29
Ranking of the Round 2 Resource Alternatives
Service Area C

ALTERNATIVE	1 • CPA 1 • Transfers 64D / 38N	2 • CPA 2 • Transfers 57D / 31N	3 • CPA 2 • R. 5 TAF • Transfers 52D / 26N	4 • CPA 2 • R.30 TAF • Transfers 27D / 1N	5 • CPA 3 • Transfers 43D / 17N	6 • CPA 3 • R.17 TAF • Transfers 26D / 0N
Reliability	● 1	● 1	◒ 3	○ 6	○ 6	○ 6
Implementability	◒ 3	◒ 3	◒ 3	● 1	○ 6	○ 6
Present Worth Cost	$336M 3	$309M 2	$339M 4	$831M 6	$265M 1	$454M 5
Score	7	6	10	13	13	17

Response to Criteria
● High
◒ Moderate
○ Low
3 Ranking

Ranking represents a relative relationship among the six Resource Alternatives studied, to best determine those which would be selected for final analysis.

Exhibit E-30
Resource Alternatives for Service Area C

Year 2020
(with Assumed CVPIA Reductions of 15%)

Service Area C
Projected Demand: 210 TAF

ALTERNATIVES					
1	2	3	5	6
Drought/Normal	**Drought/Normal**	**Drought/Normal**	**Drought/Normal**	**Drought/Normal**
• CVP (140/166 TAF)	• CVP (140/166 TAF)	• CVP (140/166 TAF)	• CVP (140/166 TAF)	• CVP (140/166 TAF)
• *[CPA 1 (6 / 6 TAF)]*	• *[CPA 2 (13 / 13 TAF)]*	• *[CPA 2 (13 / 13 TAF)]*	• *[CPA 3 (27 / 17 TAF)]*	• *[CPA 3 (27 / 22 TAF)]*
		• Reclamation (5 / 5 TAF)	• Reclamation (17 / 17 TAF)	• Reclamation (17 / 17 TAF)
• Surface Water Transfers/Rights (33-64 / 38 TAF)	• Surface Water Transfers/Rights (26-57 / 31 TAF)	• Surface Water Transfers/Rights (21-52 / 26 TAF)	• Surface Water Transfers/Rights (12-43 / 17 TAF)	• Surface Water Transfers/Rights (0-26 / 0 TAF)
PRESENT WORTH COST				
$336 M	$309 M	$339 M	$265 M	$454 M
COST PER ACRE-FOOT				
$208	$187	$205	$155	$266

Water Transfer and Water Storage Components

The District identified a preferred list of potential water transfer opportunities, narrowing the total 84 regional supply sources to the six most promising candidates based on current market availability. The sources listed below and presented in Exhibit E-31 are believed to be the most implementable today. These sources are considered strong based on their availability and willingness to market water for sale in recent years. The six identified sources include:

The identification of a potential source of water supply in this Study does not imply a willingness to develop or provide resources to CCWD by a participating agency or project.

- Oroville-Wyandotte Irrigation District
- Yuba County Water Agency
- Sutter Mutual Water Company
- Reclamation District 108
- Natomas Central Mutual Water Company
- East County/Delta Sources

CCWD may also be able to arrange for a transfer to the CCWD Service Area of some of the ECCID water for which it has contracted and can currently be served only within ECCID boundaries. However, such an arrangement may be challenged by other water users if the water transferred has not been used by ECCID in recent history. The transfer market, driven by supply and demand, is constantly changing. These recommendations are based on today's environment; six months from now this list could change. Other sources should continue to be examined and revisited during future updates of the FWSS.

Environmental Considerations Associated with Surface Water Transfers

All transfer opportunities could result in minimal adverse and beneficial impacts to upstream users and would not result in any substantive land use changes. Upstream impacts are considered minimal because: (1) the proposed transfer amounts are a small percentage of the overall inflow to the Delta; and (2) the assumption that proposed transfer water is "excess" water for the agency which would either flow into the Delta anyway, or remain as carryover storage in upstream reservoirs.

The schedule of a transfer for a specific source would be optimized with the District's seasonal requirements to the greatest extent possible. Environmental requirements, especially within the Delta; will be important in negotiating a schedule that balances the District's needs with environmental considerations.

RATE IMPACT ANALYSIS

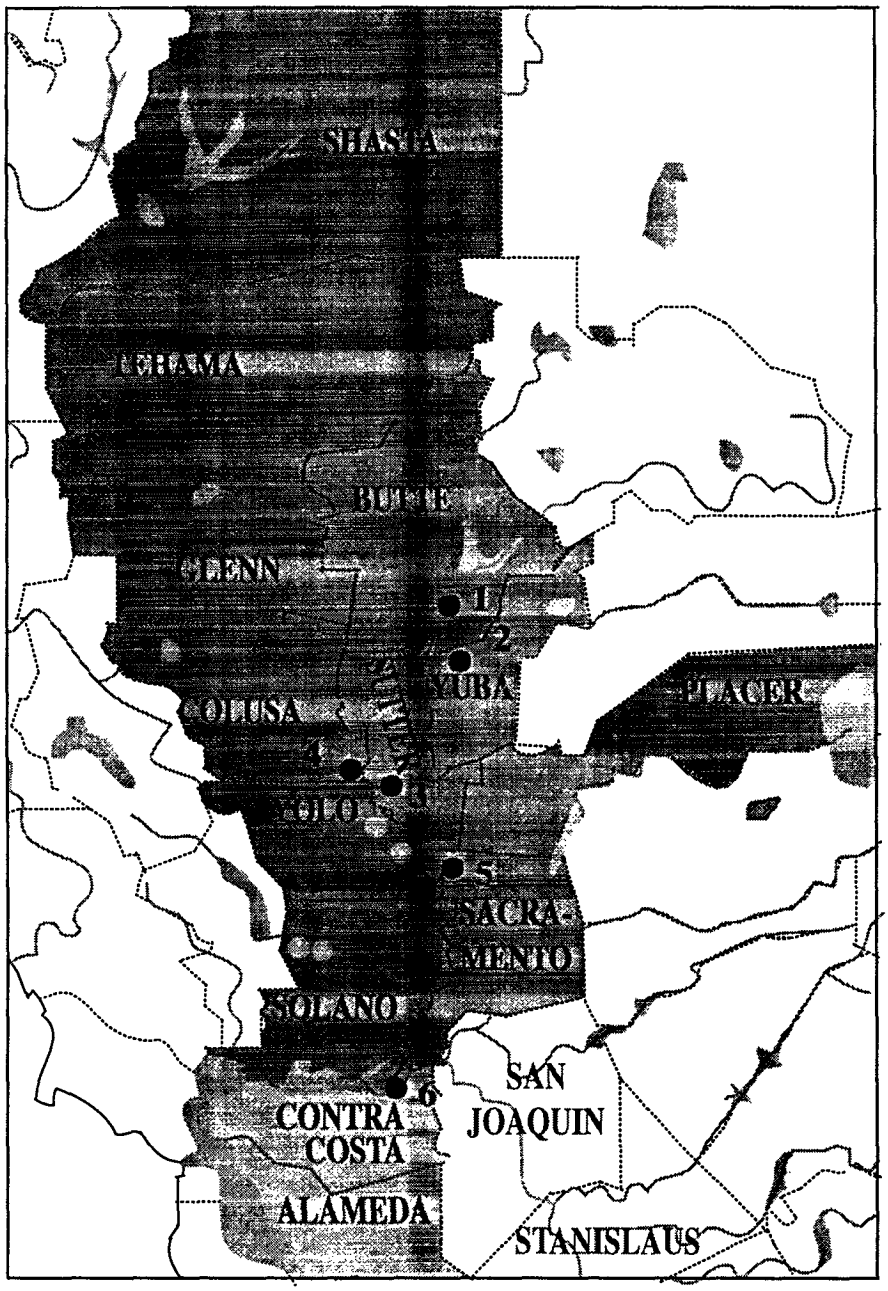
The purpose of the rate impact analysis is to determine how the cost of various Resource Alternatives will affect customer water bills. Resource Alternatives 1, 2 and 3 were evaluated, each with different capital and operating costs. Impacts of the programs were assessed and compared to determine whether a program or group of programs adversely impacts rate payers.

Results of the Rate Impact Analysis

Exhibit E-32 summarizes rate impacts from implementing Resource Alternatives 1, 2 and 3, showing cost per ac-ft for future and 1996 dollars. The 1996 dollars were derived

C-100484

Exhibit E-31
Potential Supply Sources



1. Oroville-Wyandotte Irrigation District
2. Yuba County Water Agency
3. Sutter Mutual Water Company
4. Reclamation District 108
5. Natomas Central Mutual Water Company
6. East County/Delta Sources

by dividing all future year costs by the compounded inflation rate to that year. Each cost is based on meeting 100% of demand.

Rate analysis indicates that implementation of the Preferred Alternative would not result in additional impacts on rates because the current rate structure includes a placeholder of 20 million dollars for the next 10 years for the purchase or transfer of water rights.

Exhibit E-32
Summary of Resource Alternative Costs

Alternative Costs Basis		Year 2000 ($ per ac-ft)	2020 ($ per ac-ft)	2040 ($ per ac-ft)
10-Year CIP/ Rate Analysis[1]	*Future$*	*827*		
	1996$	*680*		
Resource Alt.1	Future$	838	1,381	2,739
	1996$	689	518	469
Resource Alt. 2	Future$	856	1,408	2,745
	1996$	703	528	470
Resource Alt. 3	Future$	856	1,479	2,790
	1996$	703	555	478

Note: Chart reflects total District costs assuming Resource Alternatives 1, 2 or 3.
1 Shown for comparative purposes only. 10-Year CIP/Rate Analysis costs do not include the provision of drought year supplies.

The key finding of the analysis is that, using a melded cost approach in future or 1996 dollars, there is little difference among Resource Alternatives and that any one, or combination of alternatives, could be selected without unduly affecting water rates as compared to the current 10-Year Capital Improvement Program (CIP).

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SCREENING AND RANKING THE REMAINING RESOURCE ALTERNATIVES

The remaining three Resource Alternatives were evaluated and ranked against the key criteria in relation to one another. In addition, the trade-offs between economics, reliability and implementability were examined. In identifying the Preferred Alternative, reliability, implementability and economic criteria were considered equally.

Evaluation of Cost

The present worth costs of the three Resource Alternatives were presented earlier. Based on this analysis, Resource Alternative 2 ranks the highest (i.e., lowest cost- $309 million), followed by Resource Alternative 1 ($336 million) and Resource Alternative 3 ($351 million based on the 1.7 TAF increase in reclamation). Based on the rate analysis model, there are only minor differences between the three Resource Alternatives.

Evaluation of Implementability

The key to implementation of the Resource Alternatives is the water transfer component. Transfers, while complex to negotiate, have become more commonplace in the last five years. As all three Resource Alternatives require transfers of approximately the same magnitude (24-38 TAF by 2020), no substantial implementation differences are foreseen. Therefore, evaluations regarding implementability were based primarily on the conservation programs included within the alternatives. The three Resource

Alternatives contain either CPA 1 or 2 as a component. Although both programs are perceived as reasonable to implement, CPA 1 would require less effort from District customers and retail agencies and consequently would be easier to implement. The reclamation project included in Resource Alternative 3 would require additional negotiations with wastewater agencies and potential customers. It is therefore considered slightly more difficult to implement. Exhibit E-33 displays rankings for the three remaining alternatives.

Evaluation of Reliability

Resource Alternatives 1 and 2 are ranked High for technical reliability, while Alternative 3 ranked Moderate. Alternative 1, which includes CPA 1, has a higher drought reliability than Resource Alternatives 2 and 3, which include CPA 2 and rank equally. Because CPA 1 is a less aggressive conservation program, there are more opportunities for customers to make additional cutbacks during droughts. Therefore, it is easier for customers to respond to drought shortages with CPA 1 than with CPA 2. Drought reliability could be improved for all three of the remaining Resource Alternatives through the use of water banking although banking is not considered necessary for near-term solutions.

Cost vs. Implementation

In the case of Alternatives 1,2, and 3, differences in costs due to implementation are not expected to be significant in terms of transfer water. Resource Alternative 3 would likely require the greatest implementation hurdles due to the combination of reclamation, CPA 2 and a water transfer of significant size.

Exhibit E-33
Ranking of the Remaining Resource Alternatives

RESOURCE ALTERNATIVE	1 • CPA 1 • Transfers 64D/38N	2 • CPA 2 • Transfers 57D/31N	3 • CPA 2 • R. 6.7 TAF • Transfers 50D/24N
Reliability			
Technical	● 1	● 1	◒ 3
Drought	● 1	◒ 3	◒ 3
Implementability	● 1	◒ 3	◓ $351M[1] 3
Present Worth Cost	$336M 3	$309M 1	$339M 3
Near-term (2000/2020) Rate Analysis (1996$)	$689/ac-ft $518/ac-ft 1	$703/ac-ft $528/ac-ft 3	$703/ac-ft $555/ac-ft 3
Score	7	11	15

Response to Criteria: ● High, ◒ Moderate, ○ Low, [3] Ranking

1. The increased cost from $339, shown in the earlier Exhibit E-29, to the $351 reflected for this Alternative in the Exhibit above, is due to the addition of 1.7 TAF in reclamation which was included to increase the reliability of Alternative 3.

Ranking is a result of further refinement, identifying a relative ranking among the three Resource Alternatives.

Cost vs. Reliability

Although Alternatives 1, 2 and 3 are considered reliable at this point in time, issues of reliability will continue to require revisiting in future updates. The implementation of drought management necessitated by a shortage of supplies can bring about widespread indirect costs. Such economic considerations include the cost of the drought management program itself, as well as the temporary loss of jobs within the landscape sector, replacement of landscaping, loss of recreational opportunities, damage to fish and wildlife, and reduced sales to the District.

IDENTIFYING THE PREFERRED ALTERNATIVE

A balanced, long-term plan which provides reliability and flexibility is the best solution to the District's need for additional water. The ideal strategy would provide CCWD with supplemental water during drought years, yet allow the District to market surplus supplies during normal and wet years. A reliable supply would meet demand in most years, especially drier years and in the summer.

The Preferred Alternative, therefore, is a resource strategy that allows for a mix of components to be implemented over time and includes periodic updates. Its near-term Action Plan begins with the components within Resource Alternative 1: the current contract for CVP water, implementation of conservation (CPA 1) in 1997, and the simultaneous pursuit of at least six transfer sources as soon as practical.

The District has identified Resource Alternative 1 as the Preferred Alternative based on its higher ratings on implementability and reliability. Preliminary rate impact screening revealed that rate impacts associated with the three Resource Alternatives are similar. The Preferred Alternative leaves open future opportunities to increase conservation and pursue reclamation projects, depending on the success of the components, growth in the District's service area, and/or further reductions in supplies.

THE IMPLEMENTATION PLAN

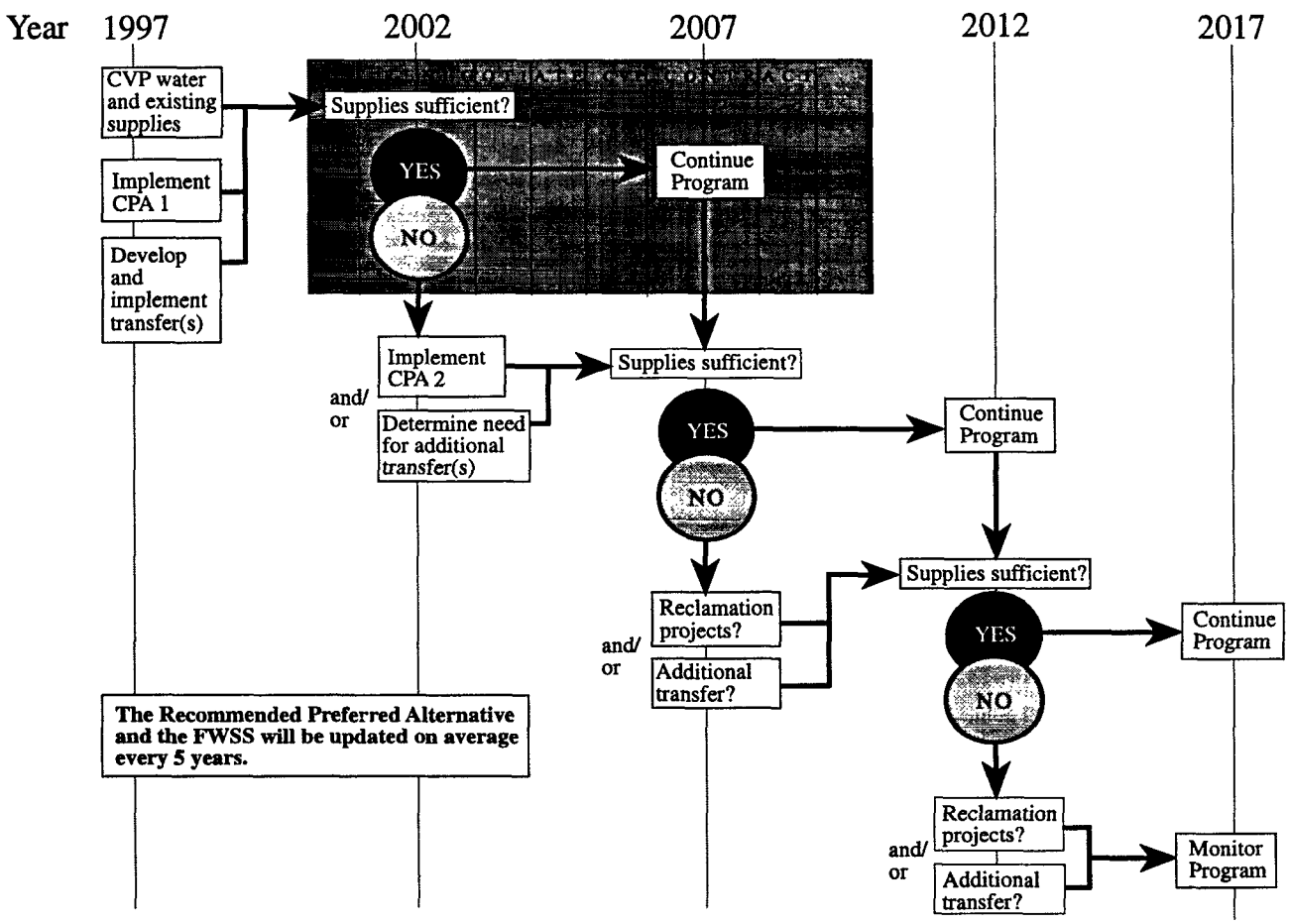
The Preferred Alternative is a resource strategy that allows for a mix of components to be implemented over time and includes periodic updates. The Implementation Plan consists of both a near-term Action Plan to meet demand in the near term, as well as a long-term Implementation Schedule to respond to changing conditions through the year 2040.

NEAR-TERM ACTION PLAN

CPA1 is less costly in the short term, and since the water savings are conservative, additional water savings could potentially be achieved without the additional funding required for CPA 2.

The Preferred Alternative should be implemented in phases to meet the growing shortages that will occur in the future, to allow for flexibility in meeting future demand, and to facilitate periodic updates. Exhibit E-34 displays the manner in which phasing allows the District to respond to near-term needs. Components of the near-term Action Plan include the current contract for CVP water, implementation of CPA1 in 1997, and the simultaneous pursuit of (at least) the following six transfer sources for sufficient quantities as soon as practical to meet dry-year shortages of the District:

Exhibit E-34
Near-term Action Plan for the Preferred Alternative



- Oroville-Wyandotte Irrigation District
- Yuba County Water Agency
- Sutter Mutual Water Company
- Reclamation District 108
- Natomas Central Mutual Water Company
- East County/Delta Sources

The transfer sources identified are believed to be the most implementable for the District today given available information, but are subject to change in the near future.

The following sections discuss the implementation of the near-term Action Plan based on the components within the Preferred Alternative, their relationship to the District's drought contingency plan, and associated capital, operations and maintenance costs.

CVP Contract

The District's CVP contract expires in 2010, but the CVPIA encourages, through penalty charges, early renewal. The District could opt to wait until the year 2010 to renegotiate the contract based on the quantity of water, if any, that needs to be replaced. However, it may be advantageous for the District to negotiate earlier with the Bureau. The decision will be weighed based on the reduced amount available under a new contract and the costs (due to CVPIA) of $20 per ac-ft (1996) for failure to renew early. Issues to be addressed in the contract negotiations would include 1) contract entitlement; 2) the Delta Protection Act; 3) shortage provisions; 4) credits for reclamation and conservation; 5) implementation of the CVPIA requirements; 6) and water costs.

Implementation of CPA 1

CPA 1 expands the District's current conservation efforts to encompass wholesale and retail customers. Staffing levels will increase between now and the year 2020 and then drop off very slightly in the year 2040. It is anticipated that a total of six new staff will be required by the year 2000. The schedule for hiring new staff between now and the year 2000 is presented in Exhibit E-35. Exhibit E-36 presents the full-time equivalent staffing required to implement CPA 1 in the years 2000, 2020 and 2040.

Exhibit E-35
CPA 1 Staffing Schedule

Current Staffing	1997	1998	1999	2000
5.3	6.3	7.3	8.3	11.3

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While CPA 1 will achieve a District-wide 5% reduction in the year 2040, different reduction goals will be achieved by each of the major customer categories. These reduction goals are presented in Exhibit E-37. The success of CPA 1 will depend on cooperation between CCWD and its wholesale customers, with communication between parties essential. Monitoring and evaluation of conservation savings and customer demand through program record-keeping practices should be an ongoing process in the near-term Action Plan.

Developing Water Transfers

Transfers will be used to bridge the gap between future supplies and projected demands. In the near-term, water transfers should assist the District in meeting demands during a drought, and meshing with the reduction in CVP supplies over the 10-year renewal window for CVP supplies (2000-2010).

The initial steps which need to be taken by the District, prior to implementation of a water transfer, include: 1) the need to resolve outstanding issues regarding the Delta Protection Act; 2) a determination of the most favorable timing for CVPIA renewal; 3) development of a timeline integrating the need for near-term drought supplies of at least 35 TAF to be phased into a normal year requirement of an additional 20 to 40 TAF over the years 2000-2010, dependent upon the renewal of the District's contract; and 4) the development of a negotiation strategy which sets priorities for the District in terms of the phasing of water from dry year only to every year transfer needs, seasonal sched-

Exhibit E-36
Staffing Requirements for CPA 1

Conservation Measures	CPA 1 - Year 2000 P1	P2	P3	T	CPA 1 - Year 2020 P1	P2	P3	T	CPA 1 - Year 2040 P1	P2	P3	T
Public Information	1.0		0.5		1.0		0.5		1.0		0.5	
Pricing and Incentives												
Ordinances/Plan Reviews		0.1				0.2				0.3		
Audits												
Residential		1.9	0.9	3.7		2.3	1.2	4.7		2.6	1.3	5.1
Commercial & Lt Industrial		0.8		1.1		1.3		1.7		1.5		1.9
Large Turf		1.3		1.8		2.1		2.7		2.3		3.1
Industrial		Consultants will be used.				Consultants will be used.				Consultants will be used.		
Audit SubTotal		4.0	0.9	6.6		5.7	1.2	9.1		6.4	1.3	10.1
ULFT Rebate Program		1.0		1.0		1.0		1.0		Measure ends in 2020.		
Total Staff	1.0	5.1	1.4	7.6	1.0	6.9	1.7	10.1	1.0	6.7	1.8	10.1
Full Time Equivalent (FTE)	1.0	5.1	1.4	3.8	1.0	6.9	1.7	5.1	1.0	6.7	1.8	5.1
	Total FTE =			11.3	Total FTE =			14.7	Total FTE =			14.6

Note: The System Operation and Loss Reduction Measure would add 1 maintenance staff to each of the totals.

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Permanent Staff (P)
P1 - Program Administrator
P2 - Conservation Specialist
P3 - Conservation Specialist

Temporary Staff (T)
T - Auditors

Temporary staff are half-time.

Exhibit E-37
2040 Savings Goals by Customer Category

Customer Category	CPA 1	CPA 2	CPA 3
Single Family	6%	10%	14%
Multi Family	5%	9%	13%
Commercial & Light Industrial	5%	9%	13%
Large Turf	7%	12%	18%
Industrial	2.5%	4%	6%
District-Wide Reduction	**5%**	**9%**	**12%**

uling requirements, preferred financing methods, and a preferred cost range based on recent market prices.

Implementing a Water Transfer

Implementing a water transfer is outlined in the following steps. The District has identified a shortlist of potential transfer sources as part of the FWSS. The shortlist is composed of sources that, at present, have the greatest likelihood of providing supplemental transfer water to the District.

Negotiation of Transfer Terms. The negotiation of transfer terms would begin once willing sellers of favorable sources were identified (at present six have been identified). Terms to be negotiated include, but are not limited to, the following:

- Seniority or priority of water rights
- Quantity, rate and schedule of transfer flows
- Season of transfer
- Sale price
- Point of diversion
- Place of use
- Purpose of Use
- Carriage water/environmental water charges and responsibilities
- Wheeling charges (if any)
- Termination clause
- Future options on additional water
- Duration of contract and renewal conditions
- Lack of potential challenges

Prefiling Consultations. Prior to filing a petition with the State Water Resources Control Board, both the transferring and receiving agencies would initiate prefiling consultation meetings. These consultation meetings would be held with intermediary agencies who facilitate transfers through negotiations, exchanges, banking and conveyance facilities, as well as agencies responsible for enforcement of State and Federal laws.

Environmental Review. It is anticipated that the District will be preparing a Programmatic EIR that encompasses results of the FWSS. This EIR would also include a review of impacts associated with transfers to the District that would occur in the District's service area, at the intakes and among the conveyance facilities of the District, and within the Delta. The assessment, however, would not cover transfer impacts upstream of the Delta; such impacts would be addressed in a separate environmental document.

Development of Draft Transfer Petition. After negotiating an agreement with the transferring agency and conducting pre-filing consultations with the appropriate agencies, a draft transfer petition can be developed. The draft petition would include the statutory authority, identification of source, and change in point of diversion or place and purpose of use, quantity and rate of flow, period of transfer and completion of standard SWRCB forms.

Formal Consultation. Prior to submitting a petition to the SWRCB, the District will need to consult with the appropriate Regional Water Quality Control Board (RWQCB) and California Department of Fish and Game (CDFG) regarding the effects of the proposed change on water quality and on fish, wildlife, and other instream beneficial uses, respectively.

SWRCB Approval Process. The approval process for a transfer submitted to the SWRCB includes the following steps: file petition, notice of petition, period for comments, evaluation by SWRCB, the potential for a hearing if deemed necessary by SWRCB, and the issuance of an order. The length of the approval process varies widely depending on the requirement to conduct a hearing, but is estimated at approximately 8 to 10 months.

Drought Contingency Plan for the Short-term

The District includes a plan within its Urban Water Management Plan to address short-term or emergency water management practices required during a drought or other water shortage condition. The shortage plan includes six steps:

1) Forecast Supply Situation in Relation to Demand
2) Assess Drought Mitigation Options
3) Establish Demand Reduction Plan Stage
4) Select Allocation Methods
5) Adopt the Drought Plan
6) Monitor Results and Adjust Drought Status

Step 3 refers to the demand reduction stages within the District's plan, as shown in Exhibit E-38.

Exhibit E-38
Demand Reduction Plan

Demand Reduction	Stage	Type	Total Reduction Goal	Single Family Goal
Voluntary Conservation	I	voluntary	5%	5%
Water Alert	II	voluntary	15%	15%
Water Emergency	III	mandatory	25%	30%
Water Crisis	IV	mandatory	40%	50%

Capital and O&M Costs

Capital and O&M costs are an important consideration within the Implementation Plan. The Preferred Alternative must maintain consistency with the District's CIP and rate revenue stream. All components of the near-term Action Plan have been accounted for in the District's current 10-Year CIP.

Annual Costs. Near-term annual costs for the Preferred Alternative would include costs of CVP water, implementation of CPA 1, and purchase and delivery of water when needed (particularly drought years).

2-year Budget. The District now uses a 2-year budget cycle. The current amount budgeted for the implementation of CPA 1 for FY96-97 is $778,000, increasing in FY97-98 to $832,000. The amount requested in the budget for implementing a water transfer over FY 97 and FY 98 is $2.0 million including staffing needs.

Capital Improvement Program (CIP). In some cases, placeholders for capital projects required to implement FWSS recommendations were included in the CIP because detailed project information was unavailable. The costs for obtaining water transfers under

the Preferred Alternative are estimated to range between $10 million and $23 million through the year 2010. The 1997-2006 CIP has a placeholder of $20 million over the next 10 years.

The costs to purchase or transfer water rights are already built into the 10-year CIP, therefore, the Preferred Alternative does not have a significant impact on current water rates.

Rate Analysis. Implementation of the Preferred Alternative would not affect rates and is consistent with the current CIP. The largest FWSS expenditure is to purchase, or transfer, water rights. Since these costs are already built into the 10-year CIP, the Preferred Alternative does not have a significant impact on current water rates.

Consideration for Water Purchases. The District could choose to pursue a water transfer or combination of transfers through any variety of financing methods.

The most cost-effective method would be the purchase of a water rights entitlement in which all drought water demand is purchased up-front in perpetuity; this would ensure the availability of water if and when a drought occurs. The drought cutback was estimated to be approximately 25,000 ac-ft. Perpetual water rights for the maximum drought demand of 25,000 ac-ft per year might be purchased for $1,000 per ac-ft, based on the estimated current market price. Water not needed for drought conditions would be sold for an estimated $50 per ac-ft. This approach resulted in the lowest net present value of the four water methods investigated, and a negative cumulative investment by 2040 because the favorable purchase cost is up-front and the unneeded water sales in non-drought years continue to reduce the cumulative investment.

LONG-TERM IMPLEMENTATION SCHEDULE

The long term Implementation Schedule is based on a number of considerations including the anticipated future reduction of the District's entitlement and outcome of the CVPIA, and has been developed as a framework in which to consider key questions and issues during updates of the FWSS.

Near-term to Long-term Transition

Studies by the U.S. Bureau of Reclamation for their PEIS confirm that implementation of the CVPIA creates a significant impact on CVP urban water supplies (as well as others) that would result in more frequent shortages. In essence, the CVP yield is reduced and contractors can expect lower reliability on a regular basis; this means there is a *de facto* supply reduction whether or not the contract is reduced. This requires consideration of a transition plan from near-term to long-term.

The near-term Action Plan calls for the District to pursue water supplies sufficient to meet at least 15% of demand for shortage periods. Acquisition of this amount will be sufficient to meet most shortage needs, whether from drought or CVPIA reductions, through 2005, based on Service Area C demands (the water would not be needed in every year, because of other District supplies available in wet years). After 2005, river diversions are not likely to be sufficient when coupled with the CVPIA reduction and water transfers acquired for shortages. Consequently, it is in 2005 that the District should plan to start acquiring the water needed to make up for any CVPIA reductions, with all water acquired by 2010. The amount to be acquired and the rate at which it should be acquired will be reassessed in the next update of this plan, currently scheduled in 2002. The reassessment should consider: 1) actual demands, 2) success of conservation programs, 3) the final assessment of CVP yield and 4) the final or anticipated terms of the CVP contract.

Updating the FWSS

The Future Water Supply Study is designed to be a flexible, "living" planning document, with periodic reviews and updates to respond to future water needs and changing conditions. Key questions and issues to consider during future updates of the FWSS include:

- Comparing actual and projected demand;
- Determining the success of conservation efforts;
- Evaluating whether additional conservation or reclamation savings could be achieved, and if these savings could postpone the need for additional water supplies;
- Determining whether additional conservation or reclamation would be cost-effective;
- Reviewing the availability and reliability of new water supplies; and
- Evaluating market availability and the success of any new technologies.

Future updates could be based on more definitive estimates of available supplies in the short term, once CVPIA and the CALFED Program Alternative are closer to implementation.

Potential to Implement CPA 2. If during FWSS updates the District determines that demand is higher than anticipated and CPA 1 is not as successful as anticipated, CCWD may choose to formally implement CPA 2. The District will want to evaluate whether additional savings could be achieved, whether it would be cost-effective, and if potentially it could reduce the need for expansion or development of additional facilities.

Reclamation. A review of reclamation opportunities, in terms of cost-effectiveness of projects and an updating of new technologies, should also be included in the updates to the FWSS.

Additional Water Transfer(s). Driven by supply and demand considerations, the transfer market is constantly changing. The six transfer sources identified in the short-term Action Plan are based on today's environment; six months from now this list could change. Other sources will continue to be examined and revisited prior to and during future updates of the FWSS.

Banking. Water banking as a component of an overall long-range plan can expand flexibility and reliability of the District's supplies. Banking is not viewed as necessary for a near-term solution, however, decision points will be noted on the implementation timeline for consideration and evaluation of a banking program in the future.

Other Supply Alternatives. As the near-term Action Plan is implemented and monitored, the District will discover that some components are more successful than others. Over the long term, there will also be changes in the regulatory environment, water supply markets, and water treatment and distribution technologies. This may result in future water needs being somewhat different than what is envisioned today. Consequently, as part of the FWSS updates, the District should continue to review other supply options which may include desalination, conjunctive use, water banking, etc. that are not currently included in the Preferred Alternative.

As new supplies are developed for the District such as additional groundwater supplies within the Service Area, they would be taken into account in future updates, as well as in the contractual arrangement for new supplies.

Drought Contingency Planning (Long-Term)

Future updates of the District's drought contingency plan will need to reflect the success of CPA 1, the potential implementation of more aggressive conservation and reclamation programs in the future, and the cost and availability of water transfers. A successful conservation program will most likely limit opportunities for District customers to easily reduce water use during a drought. As customer water use becomes more and more efficient over the years, the District's ability to rely on customers for short-term reductions will diminish. The District will then have to rely on lifestyle changes to meet demand. Therefore planning for drought years becomes critical as the District moves into the future.

CONCLUSION

The FWSS was developed to respond to a number of interrelated planning issues that affect the District's ability to meet future water demands. The Preferred Alternative results in a near-term Action Plan and long-term Implementation Schedule aimed at providing the District an integrated approach towards responding to these issues in a reliable, cost-effective and environmentally responsible way. The Study is an important tool to assist the District in developing a framework on which to base future decision-making. Future updates of the report will be important in continuing the process, evaluating the success of the initial near-term Action Plan and refining the Implementation Schedule of anticipated actions and options, based on updated knowledge of demand and supply trends critical to the District's future.